Personal Computer Report

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- *Your hard drive*
- *ImageWriter II maintenance*
- *AppleWorks GS*
- *GS/OS*

Third Edition

CompuShare Productivity Series

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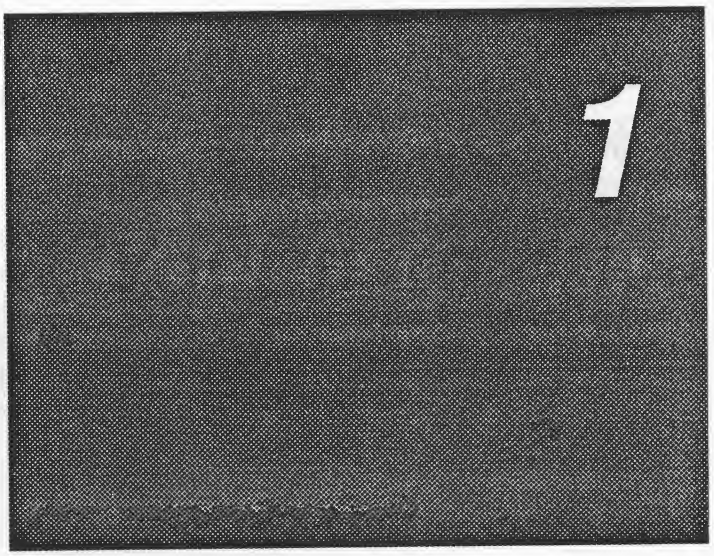
Note: This Personal Computer Report is intended for both Apple IIGS and Macintosh computer users. Most information in the report can be used for either computer. Where specific information is required, it is stated as Apple IIGS or Macintosh specific.

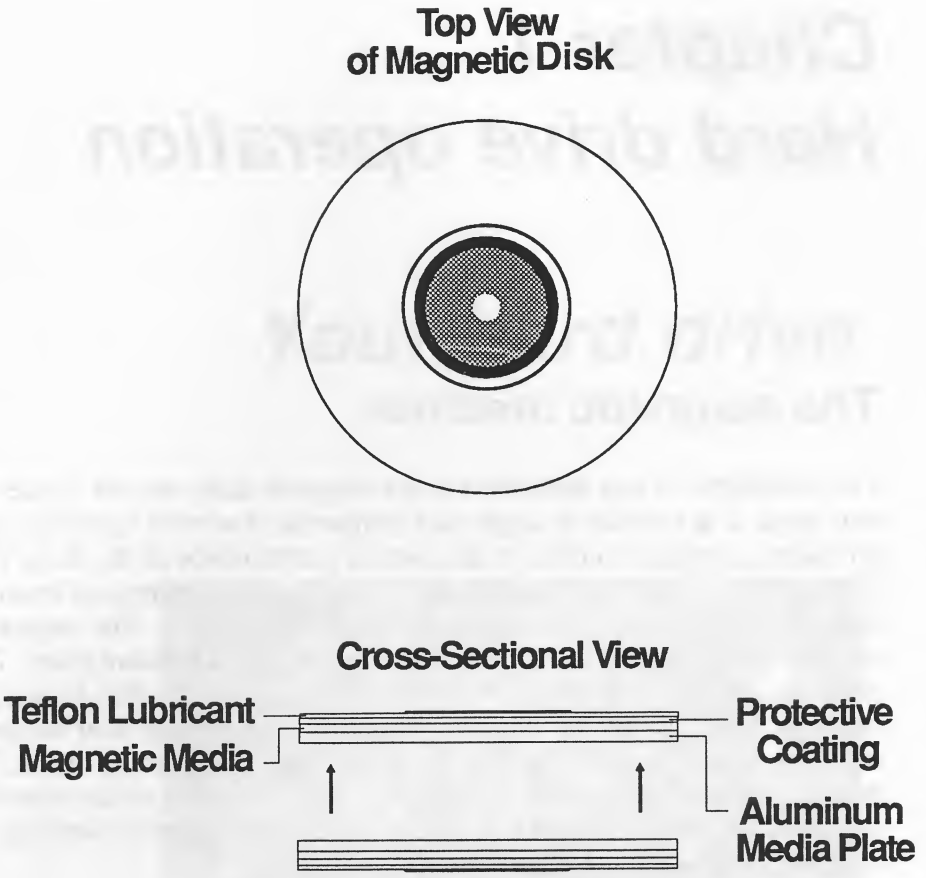
Your hard drive



Chapter 1
Hard drive operation

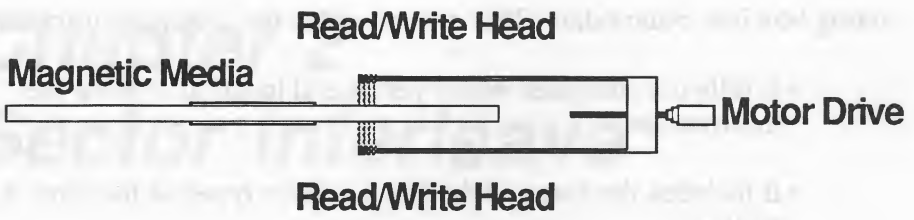
The magnetic medium

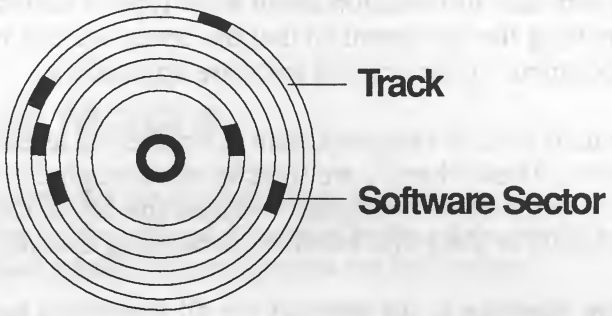
The workhorse of any hard drive is the magnetic disk; see the figure on the next page. It is circular in shape and composed of several materials, each providing a unique function to the overall performance of the disk. The core of the magnetic disk, the media plate, is commonly constructed from aluminum. This material is strong, light and inexpensive. The magnetic media is permanently attached to both sides of the aluminum plate. This provides the memory requirements for today's high-capacity drives. Disk manufacturers apply a protective scratch-resistant coating over the magnetic media and then permeate the coating with a lubricant such as teflon. This helps to protect the disk in the event the read/write head of the drive crashes into the disk. The lubricant also encourages smooth rotation between the magnetic disk and the read/write head.



Read/Write head

In a hard drive, the magnetic disk is rigidly mounted to a motor shaft, and spins at a high rate of speed. The read/write head hovers over and under the disk as shown in the top figure on the next page. The head moves back and forth over the magnetic disk while it is spinning and data is recorded on the magnetic disk in circular tracks. These tracks are further divided into sectors – the black rectangles on the disk as shown in the second figure on the next page.





Data transfer from computer to hard drive

Now that we understand the primary components of a hard drive, let's walk through the example below to understand how data is transferred from computer to hard drive.

For our example, let's save the document you have created to your hard drive. You choose the *Save As...* command while in your software application, and the computer activates the appropriate dialog box. The purpose of the dialog box is to tell the computer where to transfer the data from the computer's Random Access Memory (RAM) to disk. In the dialog box, you are able to name the document and choose the folder location for the file storage on the hard drive. Once you are satisfied with your choices, you click the *OK* button with your mouse or hit the return key and wait for the saving process to end. During the saving process, the following is executed.

First the computer gathers a certain number of bytes of your document from the RAM chips in the computer. In addition to the data gathering, the computer also translates the file locations you have chosen in the *Save As...*

dialog box into binary data. This data provides the following information:

- It tells the computer which peripheral location to store the information.
- It includes the name of the file you have typed in the *Save As...* dialog box.
- It provides information about what type of software was used when creating the document so that the computer can rebuild the document in the original software application.

After the initial code is executed, data is transferred as electrical charges to the hard drive. These charges are transferred through the supporting electronic circuitry inside the computer to either the Small Computer System Interface (SCSI) or the serial interface at blinding speeds.

Think of the interface as the gateway for all connected peripherals to your computer. The electrical charges travel through the port of the interface into the cable and to the port of the hard drive. From there, the charges are converted to magnetic fields at the read/write head of the hard drive. The read/write head transfers the fields to the spinning magnetic media as shown in the read/write head figure on the previous page.

The magnetic field alters the structure of the magnetic material by imposing a + or – magnetic field on the magnetic material. This + or – is analogous to the ones and zeros of the binary language.

The + or – magnetically charged fields are recorded onto disk sectors of the magnetic media. Each disk sector can hold 512 bytes or 4,096 + or – magnetic fields. A circle of these disk sectors is called a track; as shown in the disk sectors illustration on the previous page.

The computer sends a stream of electrical pulses to the hard drive's read/write head. The read/write head converts the pulses into magnetic fields and stores them on sectors of the magnetic disk. When the data has been transferred, the computer stops sending software sectors to the hard drive, and the read/write head of the hard drive ceases to transfer information to the magnetic disk. The saving process is finished.

Chapter 2
Sector interleave

Interleave factors

All hard drives transfer binary data from the computer to the magnetic disk of the hard drive in the form of magnetic fields while the disk is rotating. The speed of data transfer depends upon the following:

- The speed at which the computer can gather bits of data from RAM inside the computer and process them.
- The type of port the computer uses to transfer the software sectors from the computer to the hard drive.
- The hard drive's read/write speed.
- The interleave ratio for the computer and hard drive.

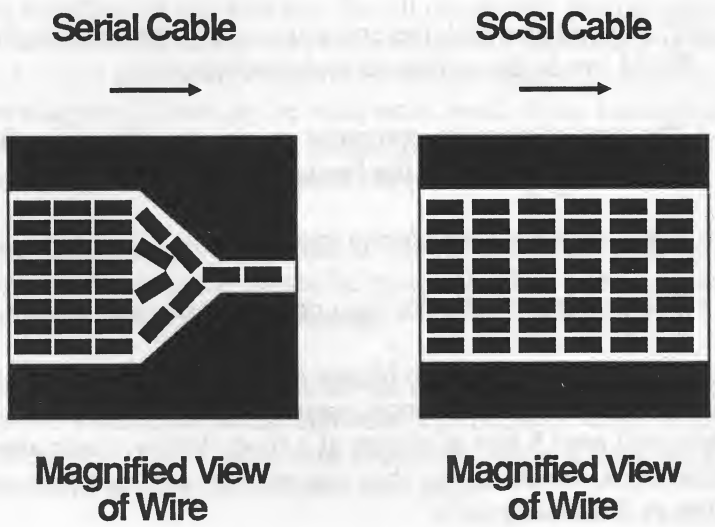
To review, remember that each binary one or zero is called a bit. When computers emerged as useful tools, most were 8 bit machines. This means that they could read 8 bits of binary at a time. Today, computers are 16 and 32 bit machines, which means they can read up to four times the data in the same time as 8 bit computers.

Every computer relies on two ingredients which determine its speed in creating and processing your computer document, command, or graphic into binary. The first ingredient, as we just discussed, depends upon the amount of data a computer can read from a peripheral at one time. The second ingredient depends upon the rate at which the computer can process the data.

The rate at which a computer can transfer and manipulate data is called clock rate. You probably have heard many times your computer having a 2.5, 8 or 16 megahertz clock rate speed. Just as you wear a wristwatch to track the rate of time movement, the computer relies upon a clock to set the rate at which it processes data. The unit of measurement for a wristwatch is seconds. The unit of measurement for a computer is frequency or number of specified actions per second.

Therefore, the computer is dependent upon the amount of data it can read at one time and the clock rate at which it can process what data it has read.

After reading or processing of data, the computer's next step is to move it from the computer to the hard drive. Apple's fast approach to binary information transfer is called the Small Computer Systems Interface, SCSI (pronounced "scuzzy" or S-C-S-I). SCSI cables use the parallel approach of transferring binary information as shown in the figure below. Parallel information transfer allows the computer to send eight bits of information at



once along parallel wires in the cable. In contrast, the serial type cable to the left can only send one bit of binary information at a time. This parallel approach to binary transfer, decreases the time it takes to get the binary data from computer to hard drive.*

* ***The Apple IIGS does not come with built-in SCSI, but you can purchase a SCSI card separately to plug into one of the 7 slots. All Macs have a built-in SCSI port.***

In review, we have learned the computer requires a certain amount of time to process data and then transfer that binary through the SCSI port to the hard drive. Transferring the binary information to the spinning magnetic disk in the hard drive requires sector interleaving. Sector interleaving is the placement of sequential sectors on a spinning disk.

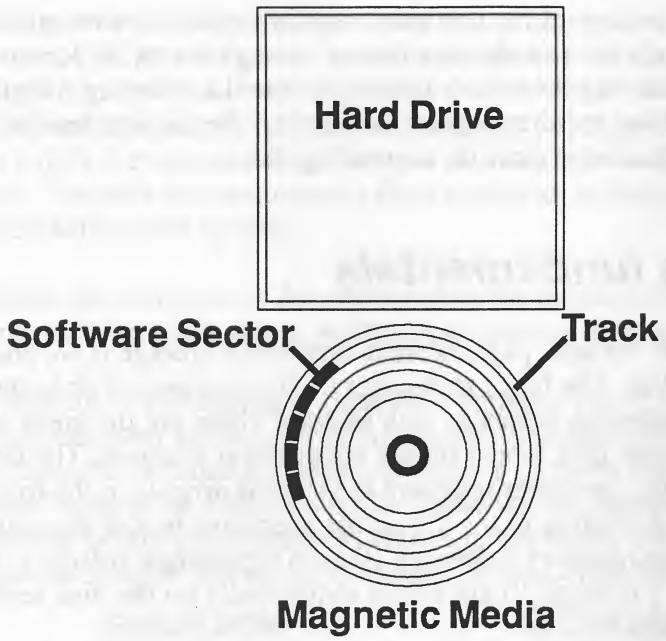
Interleave fundamentals

The illustration on the next page exhibits disk block storage if we could see the sectors on a disk. The black rectangles on the magnetic disk in the middle of the illustration represent disk sectors. These are the areas on a track of the magnetic disk where binary information is stored. The binary information that the computer transfers to the hard drive is in the form of software sectors. Referring to the 1:1 sector interleave box at the bottom of the illustration, the numbers 1 through 10 each represent a software sector. Software sectors 1 through 10 are stored sequentially on the disk sectors.

If the computer cannot transfer information to the hard drive at the same speed as the spinning of the magnetic disk, then it must use what is called sector interleaving. Sector interleaving changes the sequential pattern of the software sectors as shown in the 4:1 sector interleave box in the illustration on the next page.

Here, the sequential software sectors are stored on every fourth disk sector. That is, there are three disk sectors in between software sectors 1 and 2, 2 and 3, 4 and 5, etc. This type of interleaving is said to be 4:1 (four to one) since 4 disk sectors pass the read/write head for every one that is written to the magnetic disk.

Now let's take a look at the time savings between a 1:1 and 4:1 interleave ratio. For our example, assume the magnetic disk spins at a rate of 3200 revolutions per minute. If we calculate the number of revolutions per second, it would come out to be approximately 53. Per our explanation of sector interleaving, a 1:1 ratio means that for every rotation, the computer can transfer one track of binary information. A 4:1 ratio means that it takes four rotations of the disk in order to transfer one track of binary information. Therefore, the amount of time it takes to transfer one track of binary



Software Sectors

1	2	3	4	5	6	7	8	9	10

1:1 Sector Interleave

1	5	9	13	2	6	10	14	3	7

4:1 Sector Interleave

information from computer to hard disk for a 1:1 ratio would be 1/53 of a second since the magnetic disk is spinning at 53 revolutions per second. The amount of time it takes to transfer one track of binary information from computer to hard drive assuming for a 4:1 ratio would be 4/53 of a second. Now let's assume that the document you have just created will require 200 tracks on the magnetic disk. Total transfer time for a 1:1 interleave would be 1/53 second x 200 tracks = 4 seconds. Total transfer time for a 4:1 interleave would be 4/53 second x 200 tracks = 15 seconds. Therefore, the difference in transfer time between a 1:1 and 4:1 sector interleave ratio would be 11 seconds.

Chapter 3
Format and initialization

There are usually only three times when you will ever need to know about hard drive formatting and initialization. These include: 1) When you purchase your hard drive, 2) After your hard drive crashes and won't reboot and 3) When your hard drive is mysteriously losing files and crashing often.

Many times a hard drive is already formatted by the manufacturer. The only time when you may have to format or initialize yourself is if you are putting your own hard drive together. In this situation, after you had completed assembly of the unit, you would use the format and initialization software to configure the hard drive. The second and third situations above do involve your participation. Fortunately, the format or initialization process is identical for both 2 and 3. The following sections will discuss the format and initialization options used to get your hard drive up and running.

Crashing and bombing

Before we discuss the fundamentals of hard drive format and initialization, let's review the difference between a crash and a bomb. You will hear each during computer conversations and we use the term crash frequently in this report.

Many users have experienced a computer bomb during a computing session. You are working on your computer, when suddenly either a

message appears with a bomb icon that communicates a system error number or the video screen flickers and produces wavy lines sometimes being accompanied by a crackling tone coming from your computer's speaker. All of these symptoms are the result of a computer bomb. A bomb is produced because of computer malfunction. There are many different reasons why a system can bomb. For example, the Macintosh has approximately 380 different System errors that can cause a bomb to occur. Computer bombs are almost always related to a System software malfunction.

Crashes are different from bombs because they do not usually involve the System software. A crash is almost always related to computer hardware or the actual electrical and mechanical parts that make up the hardware. Therefore, when you hear someone say their hard drive crashed, they are usually referring to a hardware malfunction. Hardware malfunctions can cause software problems. For instance, if the read/write head of the hard drive crashes into the magnetic disk accidentally it can cause damage to sectors on the disk. If damaged, the data that was stored in the sectors will be permanently lost. If the lost data were the disk directory of the hard drive, the drive would not boot and show up as an icon on your computer screen. Hard drive crashes and recovery are discussed in more detail in chapter 5 and 6 of this report.

Formatting

As we discussed in chapter 1, every hard drive has a minimum of one magnetic disk. On the disk, there are circular tracks. Each of the tracks are divided into sectors which store approximately 512K of data. A read/write head moves from sector to sector of the magnetic disk and either reads or writes data to the sectors while the disk rotates.

The formatting procedure of a hard drive works to restore and ready the software sectors to receive data. Formatting your drive is the most extensive type of fix you can perform. There may be a situation when you have experienced a crash and cannot get the hard drive icon to appear on the desktop. In this situation, your best bet may be to format the drive. The advantage to drive formatting is that it completely rejuvenates your drive by performing the following procedures.

Formatting erases all current data on the magnetic disk of the drive.

This is probably the only disadvantage about formatting. During the format, all of the data stored on the drive is erased. If your data is backed up, this should not be a problem.

Formatting locks out all bad sectors that have been detected.

The formatting process should inspect the magnetic disk for bad or damaged disk sectors. If bad sector inspection is not completed during formatting, then the format and initialization software that comes with your hard drive will have a separate option to look for back sectors. Bad sectors is another term for actual damage to the magnetic surface of the disk. This is permanent damage and cannot be fixed by software. The inspection process will locate all bad sectors and lock them out so that data cannot be stored to these damaged sectors. To lock a sector out, data is stored in the disk directory which marks the bad sectors as being unavailable. Data already stored on bad sectors cannot be retrieved.

Formatting installs the SCSI driver and SCSI boot blocks on the magnetic disk.

After the magnetic disk is erased and checked for bad sectors, the SCSI driver and boot blocks are installed at a designated location on the magnetic disk. The SCSI driver enables data to flow to and from the hard drive for read/write operations. This flow of data is parallel as discussed in chapter 2. The SCSI boot blocks are read by the computer each time you turn it on to let the computer know that a SCSI peripheral is connected to the SCSI interface. The blocks also contain the SCSI identification number. A unique identification number is assigned to each SCSI peripheral device connected to the computer. The ID number communicates the location of the peripheral on the SCSI cabling system so the computer knows the pathway to send or retrieve information from the hard drive. For more information

about the Small Computer System Interface, read chapter 4.

Formatting initializes the drive by creating the file and disk directory.

Once the SCSI driver and boot blocks are installed, the format process initializes the hard drive by creating a file and disk directory. The file directory contains all information about the files on the hard drive. This includes: file names, type, creation dates and sector locations used to store the files. The disk directory contains information about the size, number of files and free space remaining on the hard drive as well as the volume name of the drive.

The computer also creates a file to track positions of windows and icons on the Desktop – the first screen after the computer boots. The Apple IIGS calls this the Finder.Root file. The Mac uses a Desktop file for these housekeeping activities.

After the four step process above is finished, the System and Finder are loaded onto the magnetic disk. The computer works with the Finder to load the icon of the hard drive into RAM. When finished, the drive icons appears on the desktop of your computer.

Install and initialize

If you do not want to go through the process of formatting your hard drive, initialization may be the proper procedure. The initialization procedure usually is the best choice if your hard drive icon does not show up on the desktop. Install and initialize performs the following steps.

It installs the SCSI driver and SCSI boot blocks.

As discussed above, the SCSI driver and boot blocks prepare the hard drive for communication with the computer.

It erases and creates a new file and disk directory.

This step is the key difference between initializing and formatting. Formatting completely erases the sectors on the magnetic disk. Initialization does not erase the sectors, but instead erases the file and disk directory which contains information about the drive itself and the name and locations of each file on the disk. This means the actual data stored on the sectors remains intact. But without the path information, there is no direct way to get at the information. Since the pathway information has been erased, the read/write head will write over the existing data stored in the software sector as if had not been present.

You can, however, use software utility applications to retrieve files that have deleted pathway information. An excellent program which retrieves Macintosh files is SUM II. If you are an Apple IIGS owner, you can purchase LifeGuard. The company names, addresses and phone numbers for these products and others are listed in the back of this report. Therefore, initialization is not as extreme since data can still be retrieved if it had not been backed up. If you do choose to restore files, do it immediately since the read/write head can write over the existing data stored in the software sectors.

Inspect the drive

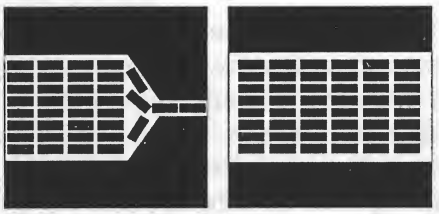
Many of the hard drives allow you to just inspect the drive for bad sectors. The software will inspect each software sector and report and defective or damaged sectors. If you are experiencing problem 3 where files cannot be accessed or are disappearing or the system bombs often, inspection of the hard drive is recommended. If you do find bad sectors, we suggest you first back up your data using back up software to try and recover the data stored in the bad sectors. Then you can lock out the bad sectors so that no more data can be written to these sector locations.

Chapter 4
Small System Computer Interface

SCSI operation

The Small Computer Systems Interface or SCSI (pronounced "scuzzy" or S-C-S-I) is Apple's standard for sending information back and forth between your computer, hard drive and many other SCSI peripherals. The advantages of SCSI are speed, flexibility, expandability and standardization. Standardization to you means less confusion and more modularity.

To understand what's going on inside the SCSI cable, refer to the diagram below. To review the discussion of SCSI operation in chapter 2, SCSI cables use the parallel approach to transferring data. Parallel information transfer allows the computer to send eight bits of information at once along parallel wires in the cable. In contrast, the serial cable to the left can only send one bit of data at a time.



Serial Cable **SCSI Cable**

The SCSI cabling system is also expandable so that you can attach your hard drive and six other SCSI peripherals to your Mac or your hard drive and three other SCSI peripherals to one SCSI card in your Apple IIGS computer.

SCSI and AppleTalk differences

The SCSI cabling system provides a high-speed data transfer connection between your computer and its peripheral devices. You could think of it as your personal cabling system. With Apple computers, SCSI is the form of information transfer for hard drives, image scanners, tape back-up drives, and a host of other peripherals.

AppleTalk, however, is a network system where many computers and peripheral devices can be connected using serial communication. AppleTalk can connect up to 32 computers, printers, hard drives, and other peripherals across a distance of up to 1,000 feet.

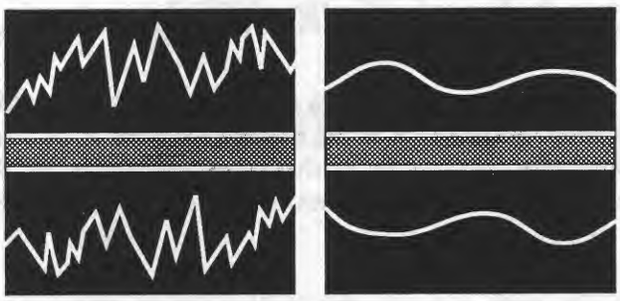
Therefore, SCSI is for one computer to connect many peripherals in a daisy chain fashion. AppleTalk is for many computers and peripherals all connected together.

SCSI connections

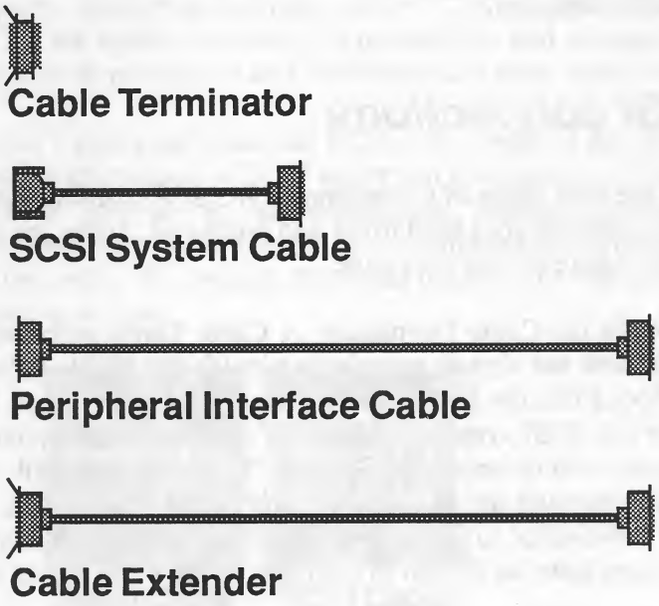
There are four types of connectors in the SCSI cabling system which can be used to connect your hard drive and computer. These are shown in the bottom figure on the next page.

The first is the Cable Terminator. A Cable Terminator acts like a damper to help smooth out signals transferring inside the SCSI cables. A noisy SCSI cable looks like the left figure at the top of the next page. Noisy lines are bad for the SCSI system. Without a Cable Terminator, data can bounce back and forth down the SCSI cable. This interferes with new data signals traveling through the SCSI cable resulting in corrupt data. By attaching a Cable Terminator to the end of your SCSI cable system, you can keep your SCSI lines quiet as shown in the right figure at the top of the next page.

The second type is the SCSI System Cable. This is rather a short cable with 25 males pins at one end and an open (female) connector with fifty pins at the other end. The 25 male pins plug into your computer port in the back of the computer. The other end connects to your hard drive.



The third type of cable is called the Peripheral Interface Cable. Its primary function is to make the connection between each peripheral device. The Peripheral Interface Cable is not designed to work as a SCSI System Cable. Therefore, you cannot use it between the computer and the first SCSI peripheral device. The Peripheral Interface Cable is about 3 feet long.



The fourth type of cable connection is the Cable Extender. It provides additional cable distance between two SCSI peripherals. It is also 3 feet long but has a different male/female connection scheme than the Peripheral Interface Cable. The Cable Extender can plug into a Peripheral Interface Cable, a Cable Terminator or a SCSI peripheral.

Attaching your SCSI cabling system

Cable Terminator attachment rules

Every peripheral device including your computer requires cable termination to prevent data bounce-back as discussed in the paragraph on Cable Termination under the SCSI connection section. Your Apple IIGS or Mac is already terminated inside the computer so it does not need a Cable Terminator. This is called internally terminated. External peripherals such as hard drives can also be internally terminated by adding termination to the processing board inside the drive. However, a hard drive can also come without termination. In this case, you are required to terminate the hard drive by adding a Cable Terminator. The following are the general rules for the attachment location of Cable Terminators.

If you are attaching one hard drive to your computer, first you must determine whether the drive is internally or externally terminated. The operation manual that comes with the hard drive should provide this answer. If it does not, call the manufacturer.

If it is internally terminated, a Cable Terminator is not required at the end of the SCSI cable system since termination is already provided by the hard drive. If the hard drive is externally terminated, a Cable Terminator is required at the end of the SCSI cable system. To attach the terminator, locate the connector on the back of the hard drive that does not have the SCSI cabling plugged into it. Plug a Cable Terminator into the available connector. The Cable Terminator can only be inserted one way so don't worry about plugging it in wrong.

If you connect an additional peripheral to a SCSI system that is already configured with two Cable Terminators and it has termination built into the peripheral, this would one too many termination points in the system. You would either have to reconfigure you SCSI system by removing one of the Cable Terminators and moving the internally terminated peripheral to the end of the SCSI system or remove the internal termination of the peripheral.

Removing internal termination can be accomplished by finding out the location of the termination inside the peripheral and clipping the proper

resistor lead which is part of the termination circuit. I would not recommend this type of operation be completed by you unless you have the skill and equipment. If you must remove internal termination of a SCSI peripheral, we recommend taking the peripheral to an authorized Apple repair center in your local area.

If you are attaching multiple peripherals to your SCSI cable system, a Cable Terminator is required for every 10 feet of SCSI cable used. Termination is also required at the end of the SCSI cable system. Determine whether your hard drive is internally or externally terminated, and follow the rules for termination attachment in the above paragraph.

Macintosh attachment specifics

Termination

A Mac Plus does not have active termination built into the computer like the Mac SE or II family of computers. Active termination means the computer continually checks for termination at the beginning and the end of the SCSI cable system.

A Mac Plus can handle two termination devices connected to the SCSI cable system. One of the termination devices would be the termination provided by the computer.

Mac SE and II type computers can handle two Cable Terminators connected to the SCSI cable system besides the termination provided by the computer since the computer will automatically turn off the termination from within the computer if two external Cable Terminators are already connected to the SCSI cable system.

Attachment

Start the connection of your SCSI cable system with your computer. Connect the SCSI System Cable to the SCSI port of the computer. You can then connect a Cable Terminator to the other end of the of the SCSI System Cable or connect the System Cable to the hard drive if it is the only peripheral to be attached to the SCSI cable system. At the end of the SCSI cable

system, if the peripheral requires external termination, attach a Cable Terminator to the second SCSI port of the peripheral. If you plan to connect more than one peripheral, attach one end of the Peripheral Interface Cable to the second SCSI port and the other end to the second peripheral. If the peripheral at the end of the SCSI cable system is requires external termination, attach a Cable Terminator to the second SCSI port of the peripheral.

Apple IIGS specifics

SCSI card tricks

As you know, the Apple IIGS computer uses the ProDOS file system. ProDOS recognizes the SCSI data transfer system, however, older DOS versions will not work.

The Apple IIGS requires an additional SCSI card which can be plugged into any available slot in the computer except slot three. Slot three is used only to add 80-column capability to your machine.

Normally, a SCSI card plugged into the Apple IIGS can accept no more than two devices on a card. However, if you put the SCSI card into slot 5, you can configure the card to connect up to four devices.

In effect, by putting the SCSI card into slot 5, you are tricking the operating system of the Apple IIGS into "seeing shadows". The System Utilities of the Apple IIGS operating system sees the first two SCSI peripherals as drive 1 and 2 of slot 5 and the second two SCSI peripherals as drive 1 and 2 of slot 2. Therefore, the Apple IIGS thinks that two of the SCSI peripherals are connected to the disk controller of slot 2 when they really are not. If you would like to use slot 5 in this manner, you must be using ProDOS version 1.2 or later.

If you set up your system this way, do not use a drive controller card in slot 2 since the System Utilities program thinks one already exists at this location. You can, however, use slot 2 for printer or modem cards.

The Apple IIGS will allow a total of seven SCSI peripherals connected to one computer on the SCSI cabling system.

Attachment

First install the SCSI card. Start the connection of your SCSI cable system with your computer. Connect the SCSI System Cable to the SCSI port of the computer. You can then connect a Cable Terminator to the other end of the of the SCSI System Cable or connect the System Cable to the hard drive if it is the only peripheral to be attached to the SCSI cable system. At the end of the SCSI cable system, if the peripheral requires external termination, attach a Cable Terminator to the second SCSI port of the peripheral. If you plan to connect more than one peripheral, attach one end of the Peripheral Interface Cable to the second SCSI port and the other end to the second peripheral. If the peripheral at the end of the SCSI cable system requires external termination, attach a Cable Terminator to the second SCSI port of the peripheral.

Setting SCSI priorities

Macintosh specifics
Setting SCSI identification priorities

In the Mac SCSI system, there can be up to 7 external peripheral devices attached to your computer. The top priority number is 7 and 0 the last priority. Your Mac always gets priority number 7 since it is the focal point of the SCSI system. The top priority enables the computer to interrupt communication between any other peripheral devices in the system to allow communication to the peripheral you want to communicate with. The Mac comes set up with a number 7 priority from Apple and it cannot be changed.

Each peripheral device such as a hard drive must have a priority number assigned to it before it can communicate with the computer using the SCSI cabling system. Always remember that higher priority peripherals will interrupt lower priority devices. Therefore, assign frequently accessed peripherals such as hard drives with a higher priority number such as 6 and peripherals such as tape backup drives which are used less often, a lower number such as 0, 1 or 2.

The priority number of hard drives are set using different schemes. The most common method is a thumb wheel, dip switch or software. To find out how your particular hard drive priority can be checked and changed, consult your hard drive's operation manual.

Apple IIGS specifics

With ProDOS®, the priority you assign to each SCSI peripheral device will determine which slot and drive ProDOS thinks it is connected to. In other words, the peripheral device with the highest priority will appear in drive 1 of the slot containing the SCSI card. The next highest device number will be in drive 2 of the same slot. In the special case of slot 5, the second two priority numbers will appear in drive 1 and 2 of slot 2 since ProDOS thinks a SCSI card resides in slot 2.

SCSI Troubleshooting

If there any difficulties after connecting your SCSI cabling system try one or more of the following:

- Make sure each connection in the system is tight.
- Check to make sure all peripheral devices are turned on.
- Check to make sure you have installed the SCSI card properly.
- Check to make sure you have connected the SCSI System Cable into the proper port of the computer.
- If more than 10 feet of cable is used in the SCSI system, make sure there is a Cable Terminator on the SCSI System Cable and one at the end of the SCSI system on the last peripheral device.
- Check to make sure that each peripheral has its own priority number from 0-6.

- Make sure that all of the peripheral devices have gone through their own formatting procedures so that they are ready to function on the SCSI system.

- Make sure that the peripheral device manufacturer has followed the SCSI interface exactly. You can do this by checking the peripheral's manual or by calling the manufacturer.

Chapter 5
Hard drive crash

If you are a hard drive user, there will be a time in your computing life when your hard drive will crash. If you back up your data, all might not be lost. Or would it? Even backups of hard drives are not always reliable. Sometimes the data being backed up can be corrupted. So what can you trust? Let's find out more about what type of data is stored on the hard drive, how data is corrupted and what types of back up etiquette to employ.

Data types

Every hard drive that is initialized for use with the Apple IIGS or Mac computer has a combination of files and directories created during the initialization process. These are loaded onto the hard drive by the computer. Their primary purpose is to store information about the hard drive and the data it contains.

File directory

A file directory is created to store information about file size, sector location, and sector position of each file and folder on the magnetic disk. The file directory also stores information about all file names, file types and a listing of what files are contained in each folder.

When you select a file, the operating system of the computer goes to the file directory and locates the name of the file and each sector location which contains information about the selected file. It then reads each of the sectors using the read/write head of the hard drive and loads the file into RAM.

Disk directory

A disk directory is created to store the hard drive name, and the number and locations of the tracks and sectors available for storage. The disk directory also keeps track of used tracks and sectors. As the disk stores additional data, the disk directory will require additional memory to keep the necessary information about the new data files.

Apple IIGS file creation

The Apple IIGS creates two files to store on the hard drive called the Finder.Data File and Finder.Root File.

The Finder.Data file's fundamental purpose is to store information about all of the files on the hard drive. Some of this information includes: file names, types, creation dates, creation programs, sector locations used to store files and folders on the drive and a list of all files contained in each folder. Each time a change is made which affects any of the files, GS/OS writes the changes to the Finder.Data File.

The Finder.Root File is the Finder's way of keeping track of all application and file icons that reside on the Desktop – the first screen after the computer boots.

Mac file creation

The Mac creates a file called the Desktop to store on the hard drive. The Desktop file stores information about positions, versions, date of creation and modification for all the files, folders, windows and icons you see on the first screen the computer presents. This screen is called the Desktop.

As you compute, the Desktop file works in the background tracking your operations. All operations are kept in a sequential order in the file. This means the Desktop file continues to grow larger with each computing session. A large Desktop file can mean slow hard drive access times since the computer must move through all the unnecessary information to find what it is requested to look for.

To maximize Desktop file efficiency, you must rebuild your Desktop file occasionally.

To rebuild the Desktop file, restart your computer while holding down the Option and Command keys during the computer startup. This compresses your Desktop file by eliminating any unnecessary information stored in the file such as information about a file that has been erased from the hard drive. See chapter 9, "Mac: rebuild the desktop" for more information.

File erasure and corruption

There are several ways a hard drive or the files on it can be trashed or corrupted. If computer users were really more aware of this situation, they would certainly back up their hard drive as if their life depended upon it.

Erasure

The first, and most frustrating, is the accidental trashing of a file or folder. During your computing frenzy, you inadvertently throw away a file or folder containing a file that you really wanted to keep. Without giving it a second thought, you select the *Empty Trash* command under the *Special Menu.* Then you remember you have not backed up the file or transferred it out of the trashed folder. In panic, you think; "What do I do now?"

A second situation, is the accidental erasure of your hard drive instead of the 3.5 inch floppy disk in the disk drive. At this point, you hold your head in your hands and wonder how you will ever recreate all of the files which were in the hard drive.

Corruption

Corruption happens when something changes or destroys information in the file directory, disk directory or the actual file.

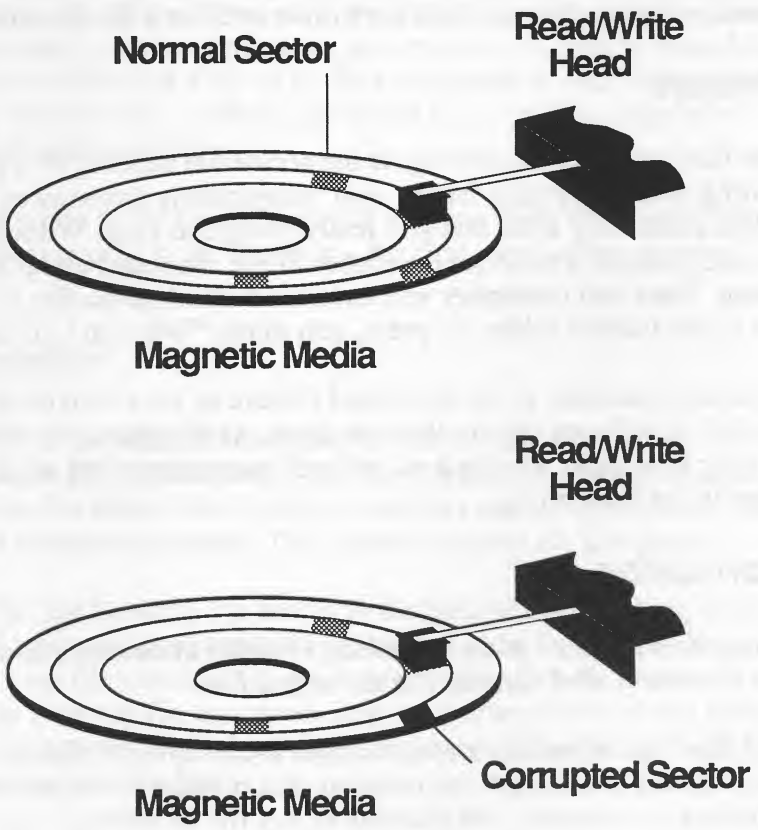
The first type of corruption can happen if the hard drive inadvertently overwrites a disk sector that contains disk directory information. If the disk directory is corrupted, the pathway to any file or software application is

destroyed. Without pathway information, a document or application cannot be found.

A second type of corruption can be attributed to the read/write head accidentally crashing into the magnetic media, damaging a sector that contains disk directory information. Damage to the disk directory exhibits the same characteristics as described above.

If either of the above happens, the hard drive loses the information path on the magnetic disk. The files are temporarily present on the magnetic disk, they just cannot be accessed because the pathway information has been destroyed.

In the figure below, the disk sectors are represented by the gray-filled



boxes. The read/write head moves from one disk sector to the next in order to access or save a file. In the second figure, the black disk sector which contained file information has been corrupted. During subsequent operations, the read/write head may write new information into the corrupted disk sector. If this happened, the data would be permanently lost.

A third way to corrupt a file is for a software application to accidentally write over a location that already contains file information. This erases a portion of the file.

A fourth way to corrupt a file is to expose the magnetic disk to magnetic fields such as a magnet.

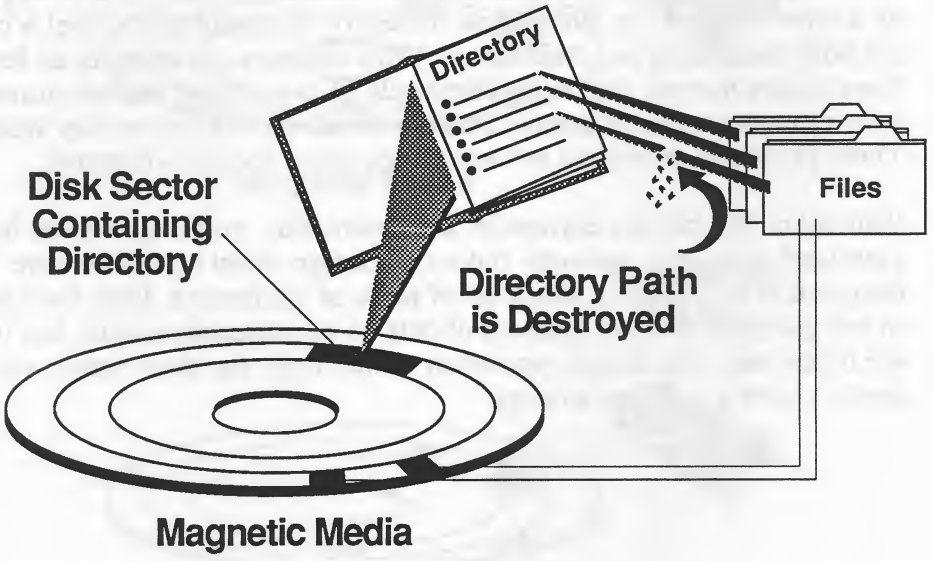
Sometimes a hard drive crash can be more severe, resulting in damaged magnetic media. Damaged media means permanently destroyed disk sectors. In this instance, even a software utility program will not help. Destruction can be attributed to many different variables such as read/write head crash, dust, salt or a sudden jolt.

The last, and most subtle type of corruption, is when your hard drive picks up a virus. A virus can attack files, folders or the entire hard drive! Viruses are both maddening and frustrating. Virus schemes can come in all forms - from simple to most elaborate. The Apple IIGS and Mac market currently have virus detection programs to help root out viruses before they attack. These programs search out and notify you when a virus is detected.

With all of this risk for corruption and destruction, you may wonder how your hard drive ever survives. It does by design. Most hard drives are designed to be a rugged, shock-proof piece of equipment. They have built in safeguards in the management of data on the magnetic media. But there are times when this design protection cannot help. For these times, you need to have a recovery strategy.

Chapter 6
Hard drive recovery

In all the previous examples, with the exception of damaged disk sectors and some viruses, the corrupted or deleted files are not really removed from the hard drive. The safeguard approach taken by Apple is to delete files by removing the pathway information or directory link from the disk directory on the hard drive as shown below. If you could rebuild the path to the files on the hard drive, the files could be restored.



The first rule of recovery

"The instant you realize a file has been trashed – STOP. Think. Reason like a computer and hard drive. Any additional actions by you could result in writing over some of the disk sectors that contain the file you are trying to restore.

Here's how the computer and hard drive treat a file that has its path removed from the disk directory. During a computing session, the computer interacts with the hard drive to update and store any new information in the disk directory. The disk directory stores information about both the disk storage availability and the location of each file.

Disk directory pathname corruption is a low-level disaster since all that would be lost is the sector locations to rebuild the file. A pathname corrupted disk directory can be easily rebuilt by using a utility program. LifeGuard™ for the Apple IIGS and SUM II™ for the Mac handle recovery of lost pathnames.*

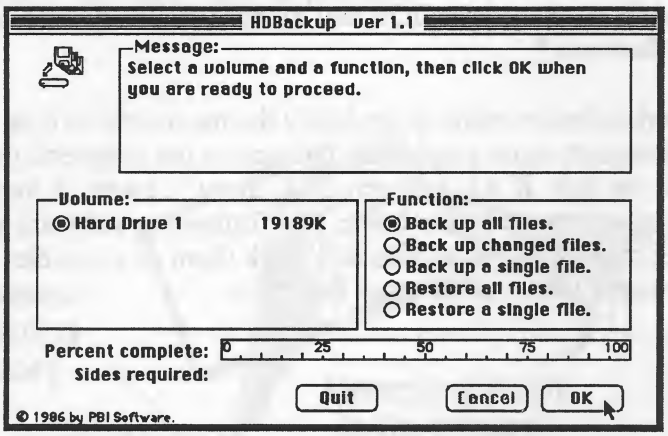
A damaged software sector is probably the most serious type of crash. Damaged sectors cause permanent damage to the magnetic media. Nothing can repair the disk. If it is a floppy disk, throw it away. A hard drive can be repaired, by reformatting the drive. The formatting software will automatically detect the damaged sectors and mark them as unusable. Back up all of the undamaged files and reformat the drive.

* ***The address and phone numbers for LifeGuard and SUM II are provided in the back of this report.***

Chapter 7
Back up

Backup software operation

Typical backup software has a similar set of features as shown in the window below. Backup software usually provides: backup volume



selection, back up all files, back up changed files, back up a single file, restore all files and restore a single file. Some other extra features include a nice graphical interface that is pleasing to the eye and feedback of the backup process using a thermometer bar to show percent completion of the backup. In order to use backup software, there are a few choices you must make before the backup begins.

First, you must select the volume you would like to back up. If you have more than one hard drive connected to your computer, the selection would be one of the drives. Volume selection also is required if you have partitioned your drive since the backup software sees each partition as a separate volume. To back up a particular partition such as Business Documents, make the appropriate choice in the backup software window.

Second, you must choose what type of backup you would like to execute. If you would like a complete backup of all your files and software applications, then choose Back up all files. If you would like to back up only files that have changed or been added since your last back up, choose Back up changed files. The backup software can locate files that have changed by checking the date and time stamp of each file. This date and time stamp is updated each time you choose the Save or Save As... command. If you have a particular file you would like to back up, choose Back up a single file.

There are many different ways backup software stores backed up data on another media such as a floppy disk.

If you choose to back up all files, this is call a *global backup*. During the back up of the files, the read/write head of the hard drive moves from track to track of the magnetic disk to search for all of the sectors that make up each file. After it has collected a number of sectors, it writes these to the floppy backup disk in a sequential fashion.

If you would like to make an exact duplicate of the hard drive, you want to perform a *mirror image backup*. Mirror image backups copy every sector of your data on the hard drive. The disadvantage of a mirror image backup is that all of the damaged and fragmented sectors are backed up. This is an inefficient use of floppy disk space.

If you choose to backup selected files or software applications, this is called an *incremental backup*.

There are many times, instead of backing up a file, you may want to restore a file or software application. This is especially handy if you had accidentally erased a file or if a file had become corrupted. To restore all of your files, choose *restore all files*. To restore a particular file, choose

restore a single file.

Once your selections are input into the backup software application, the software will scan the hard drive looking for all files that fit the criteria you have chosen. When the scan is finished, it will determine the amount of memory required for the backup and translate this into the number of 800K floppy disks required to complete the job. If the software has the floppy disk compute feature, it will display the number of floppy disks required for the back up in the window. This enables you to choose whether or not to continue with the backup and gather the required number of disks.

Then the backup software will ask you to insert the first floppy disk into the disk drive. Once inserted, the software may automatically proceed or it may check the contents of the floppy disk to see if any other data has been stored on the disk. If it finds data, it will notify you that other information exists and provide you with the choice of ejecting the disk or erasing the data on the disk. If you choose erase the disk, the software will proceed to erase the disk and ready it for backup data.

At this point, some backup software programs may ask you at this point if you would like to proceed with the backup. You can either choose *Proceed* or choose *Cancel*. If the application does not give you a choice, it will proceed automatically and start the backup process.

Another nice feature that many backup software programs have incorporated is the ability to compress backed up files. If you choose file compression, many more files can be stored on the 800K floppy disk. This reduces the number of floppy disks required for backup.

How to choose backup software

There are many different backup software applications to choose from. Some are basic backup utility programs that offer only the necessary features, while others have many different bells and whistles to make backup an easier process. If you could have your pick of the most important features, I would choose a program that has incremental backup capability of selected data and changed data. These features will make the time

required to back up quick and easy. Quick and easy means you will probably use back up data more often. And this means safer data.

Other fundamental and added features that you should look for in any backup software application you are considering to purchase, include:

Basic features

- A simple, easy-to-understand user interface
- Global backup (back up all files and software applications)
- Incremental backup (backup selected files and software applications)
- Back up changed files by date, time or specified revision
- Back up a single file
- Automatic split of large files into two smaller files by backup software
- Restore all backed up files
- Restore a single specified file

Added features

- Regular backup time configuration
- Automatic backup reminder
- Automatic backup upon shutdown of computer
- Automatic background backup to a tape drive
- Backup accuracy verification
- File compression
- Archiving features (backing up all revisions)
- Backup up files to another device on a network
- Backup report generation, which can be printed
- Virus detection of data being backed up
- Delete file from hard drive after it has been backed up
- Specification of the number of backup sets to make (1,2,3,...)
- Print catalogue feature to print all contents of the hard drive

Software buying tips

As with any software product, a well-written manual and good customer service support are key to help you learn how to use the backup software. I recommend visiting one of your local computer stores and ask to review the type of backup software they have in stock.

Before you purchase the product, review it at the store. Bring along a few files that you would like to back up. Also bring a couple of blank floppy disks to back up the data to. If they will let you review the product, and most good software stores will, copy your data to the store computer's hard drive. Then open the manual and follow the backup software installation process, if it is not already on the hard drive. Then perform the steps in the manual to back up the data you copied to the hard drive.

If the store does not have a copy to review, ask if the product you buy can be returned. This should not be out of the question since the leading mail order companies are offering money-back guarantees on many of the software products they carry. If they let you take it home, run it through the test drive discussed above. If the store does not have this policy, it's time to leave and look elsewhere for better customer service.

The backup manual

Check to see if the manual is segmented into basic and advanced features. You probably will run through the basic features during your first encounter with the program. If the program has advanced features, check to see if they match the list above or are preferable to your long term needs. Also check to see what type of customer service support the company has to offer. Some companies offer free support, while others charge a fee. Sometimes this fee can be quite large for a personal user.

Check software version numbers

Another item to check is the version number of the software. If the number is higher than 1.0, it is a product that has been around for awhile and has been upgraded and enhanced. This will be to your benefit. If it is version 1.0, the program may work great, but will undoubtedly go through changes during the first two years of its life. This means you will pay additional costs to upgrade to future versions; a hidden expense.

Backup options

There are many ways in which to back up the files and software applications on your hard drive. All vary in price. The general rule is backup convenience is more expensive. The benchmark is to backup regularly.

Back up all data you would like to keep. Use either backup software or backup manually. Backup software is recommended, especially with hard drives. The software is worth the dollar investment for the time savings. In addition to this single backup, make a second copy of data that is especially critical to you. This will ensure you always have a working copy.

If you are a frequent computer user, back up daily. If you use the computer moderately, backup weekly. Frequent computer users may want to also look into purchasing a peripheral specifically designed to perform backups such as a tape drive.

The amount of money you spend on backup devices depends upon your data value. If your data is worth less than $100, backup software and floppy disks are ample investment. If your data is worth $1000 or more, it may be time to invest in a tape backup unit.

Floppy disks

Floppies are the most economical solution. They can be used in conjunction with backup software or by themselves for manual backup. The disadvantage of using floppy disks to back up hard drives is the time investment for the backup and the multitude of disks required.

If you are without backup software, manually copying each file from hard drive to floppy disk can take hours, patience and a keen mind to remember which files you have backed up and which you haven't.

Backup software

Backup software is a wise investment. It alleviates the mental battle of manual backups, but still requires a time investment on your part. You should also know that backup software does not protect your data from a computer virus. Since most backup software copies files directly to floppy disks and update changed files by writing over older versions of a file with the new version, a virus infested file will be transferred directly to the floppy disk. Once there, it can infest other files on that floppy.

Floppies and backup software require patience and the discipline of daily and weekly backup of data. Most users who back up software this way usually end up with large time periods between backups. This greatly increases the chance of data loss in the event a hard drive crash occurs. If you value your data, backup regularly.

Tape backup

Another backup alternative is the tape backup drive. Tape backup units are priced in the same range as hard drives – from $795-$5,000.

There are many different types of storage schemes and tapes used in these devices. Some use regular cassette tapes while others use 8mm videotapes, DC-2000 tapes, reel-to-reel, VHS tapes, Beta tapes, CT-600H tapes and 1/2 inch 9-track tapes. Tapes are reasonably inexpensive and physically small

and rugged, making them easily portable.

Each tape can hold a tremendous amount of data; from 40MB to 300MB. While tape units are faster than the floppy solution, their read/write speeds are still slow in comparison to hard drives. Tape drives are not designed to be a substitution for hard drives.

Data is stored on the tape in what is called a streaming fashion. This storage process is very time consuming. As the tape moves across the write head of the drive, data is transferred to the tape. Streaming means that the head of the tape drive writes to the tape only once as it goes by. This is quite different from a hard drive which can write to the same sector on the disk many different times. To restore data from the tape requires the tape to rewind or fast forward. A single file may take 3-5 minutes to be restored.

A definite advantage of tape backup devices is the nature in which they archive information. Most tape drives record all versions of a document on tape. Therefore, if the latest version of a file has become corrupted with a virus from your hard drive, there may be a earlier version of the document on the tape which does not have the virus.

Removable cartridges

Removable hard drive cartridges are very similar to a non-removable hard drive. The only distinct different is that you can physically remove and replace the magnetic recording disk. The magnetic medium is encased in a hard plastic shell which can be inserted or ejected from the drive with a push of a button. The primary difference between the cartridge and a 3.5 inch floppy is size and amount of storage.

Removable cartridges generally range from 10 megabytes to 80 megabytes. The hard plastic cartridge protects the magnetic medium from contact with the outside environment. Inside the plastic cartridge is a magnetic disk similar to a conventional hard drive. The cartridge also contains a pair of read/write heads. These heads move along the magnetic disk from track to track reading or writing data.

Due to the portable nature of the cartridges, these heads employ a locking system where they can be parked away from the magnetic disk. This prevents the read/write head from crashing into the magnetic disk and producing permanent damage. When the cartridge is removed from the drive, the read/write heads are automatically parked and locked in place.

The advantage of removable cartridge drives is flexibility. Their operation is similar to a hard drive and they have unlimited storage per host drive. However, even flexibility has a price. This type of strategy requires planning and proper organization of files and software applications. For instance, if the size of the removable storage is 20MB, it takes careful planning to determine what should go on each 20MB cartridge so that you wouldn't have to continually swap the cartridges.

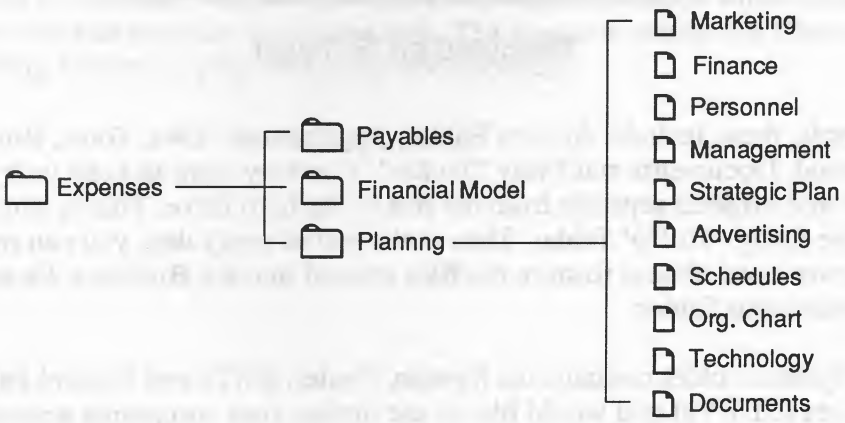
The second disadvantage is access time. Most of the removable cartridge drives are relatively slow in comparison to hard drives. This increase in access time requires patience on your part during read/write operations. Removable cartridge drives range from $899 to $2,000. The hard drive cartridges cost between $80 and $500 depending upon memory size.

Chapter 8
Hard drive organization

Every hard drive user, at some time, loses a document or application in the recesses of their drive. Finding it can become a slow and frustrating experience. Many software companies have developed software applications to help you find those lost files. While these software packages are easy to use, there are other approaches to help find your files and applications quickly and economically.

The key to computer productivity is organization and this starts with your hard drive. There are several ways a hard drive can be organized. All organization is accomplished using the Hierarchical Filing System (HFS). This system enables you to store folders in folders and files in folders to create many different levels for documents and software applications as shown below.

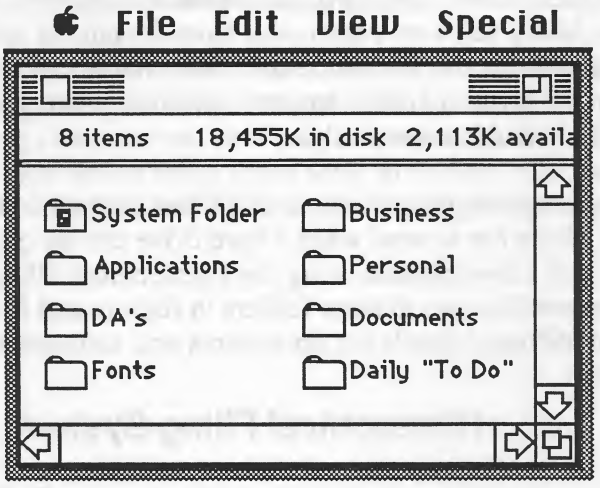
Hierarchical Filing System



In this chapter, we will discuss some generic methods for organization. You can use these methods directly or tailor them to your own needs. The bottom line is to be able to find files, folders and applications fast.

Organizing by function

Hard drive organization starts with the very first window opened while you are on the initial desktop. Organization by function separates your hard drive contents into some sort of logical groups as shown below. For our



Macintosh Screen

example, these include: System Folder, Applications, DAs, Fonts, Business, Personal, Documents and Daily "To Do". You may want to keep your daily work and projects separate from the rest of the hard drive. This is why we use the Daily "To Do" folder. Then at the end of every day, you can review your work and choose to store the files created into the Business, Personal or Documents folder.

The System Folder contains the System, Finder, INITs and Control Panel Devices (CDEVs) you would like to use during your computing session. It

may also contain other preference files or startup documents that are used by a specific software application.

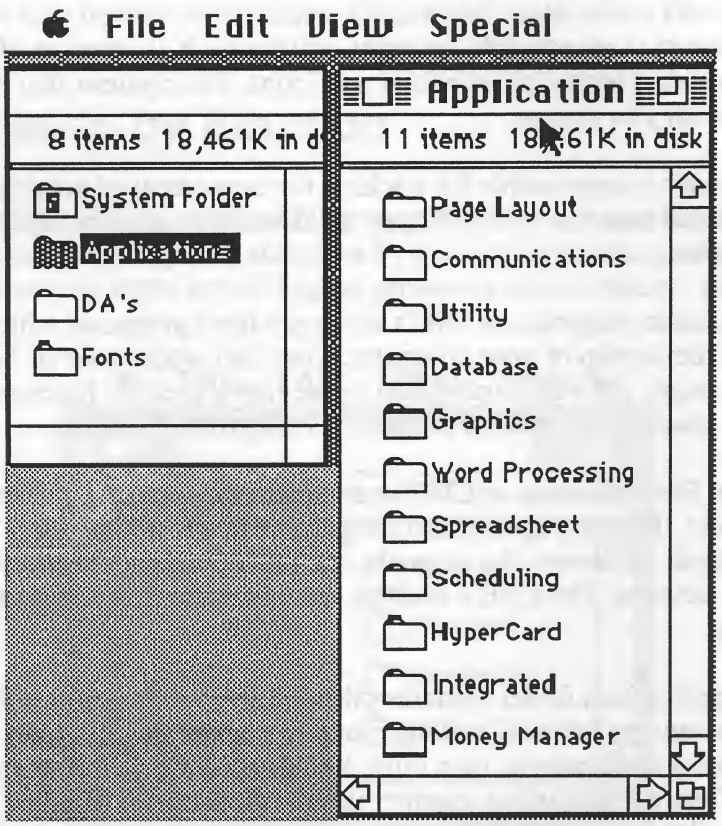
The System is responsible for many actions such as creation of the desktop with menus, commands windows and icons. The System also executes the commands you choose.

The Finder is responsible for tracking the movement of windows, files, folders and icons as well as floppy disks and the status of software applications.

Initialization programs or INITs are specialized programs which are loaded during the startup of your computer. They can work alone or in conjunction with a larger software application to provide a specific function such as screen blackening, vaccine support or background printing.

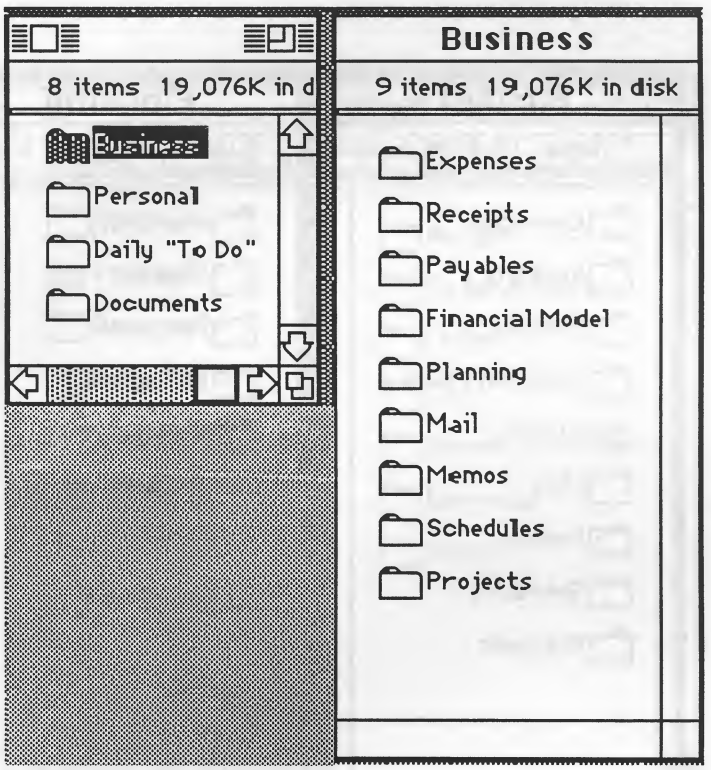
Control Panel Devices or CDEVs are also loaded during the start up of your computer. They are specialized programs that reside under the Control Panel desk accessory. An example of CDEVs include the keyboard and mouse devices. The CDEV enables you to customize the operation of these devices.

The Applications folder contains other folders which group software applications by function as shown on the next page. If you do not have very many applications, then omit the folders for each category and store all the software applications together in the Applications folder. The structure here is clean and simple. There are many other structures which work just as well and you may have your own. The idea is to utilize the Hierarchical Filing System to your advantage and organize.



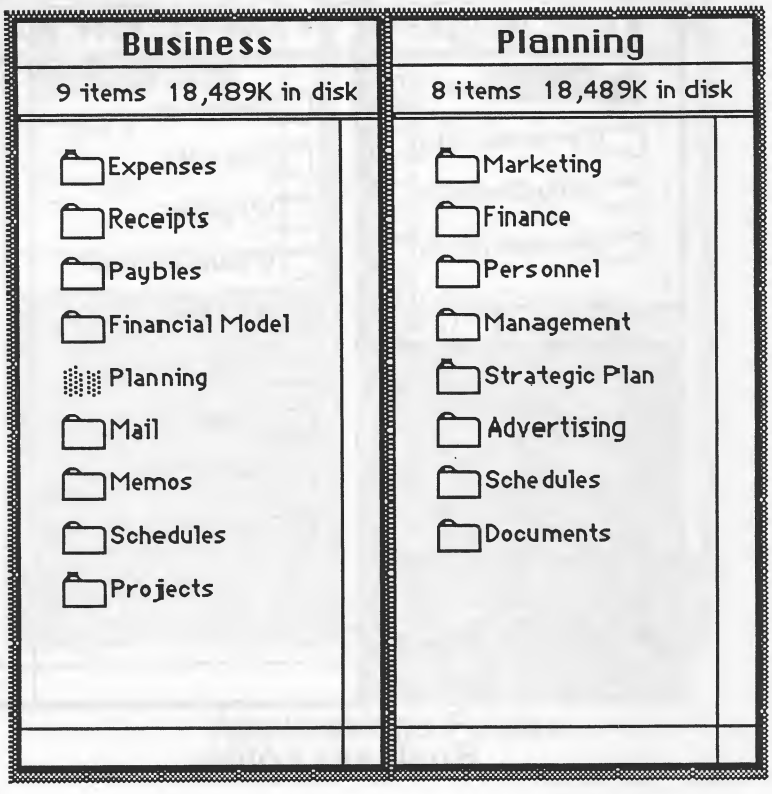
Applications Folder

The Business, Personal and Documents folders all contain files that you create using the various software applications you have. The Business folder is again divided into 9 different categories of folders to separate information as shown below. These include: Expenses, Receipts, Payables, Financial Model, Planning, Mail, Memos, Schedules and Projects.

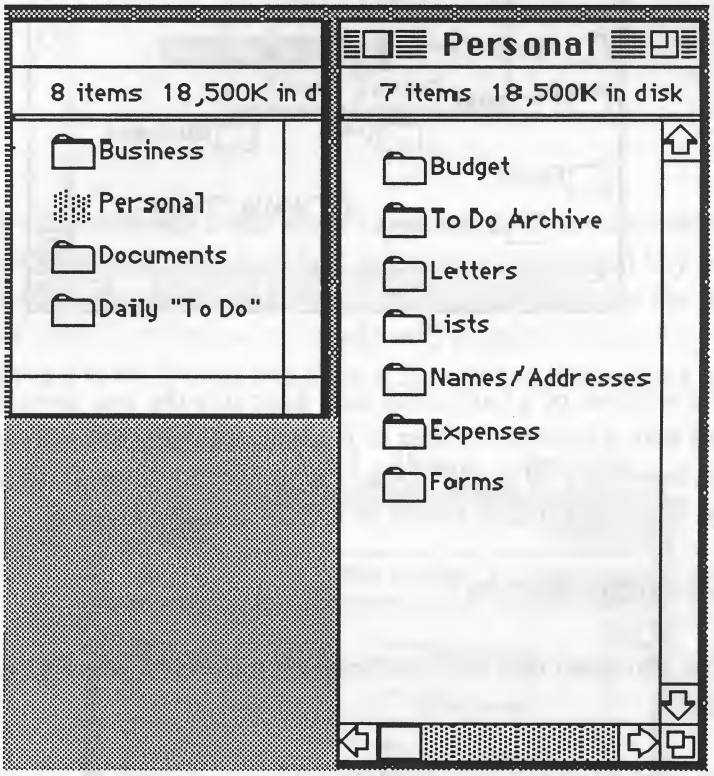


Business Folder

And, as shown on the next page, the Planning folder inside the Business folder can be separated once again into many different categories of files using the Hierarchical Filing System. Here we use: Markting, Finance, Personnel, Management, Strategic Plan, Advertising, Schedules and Documents. The Personal folder, on page 48, is also divided into 7 different categories of files including: Budget, To Do Archive, Letters, Lists, Names/Addresses, Expenses and Forms.



Contents of Planning Folder



Contents of Personal Folder

Organizing file and folder icons

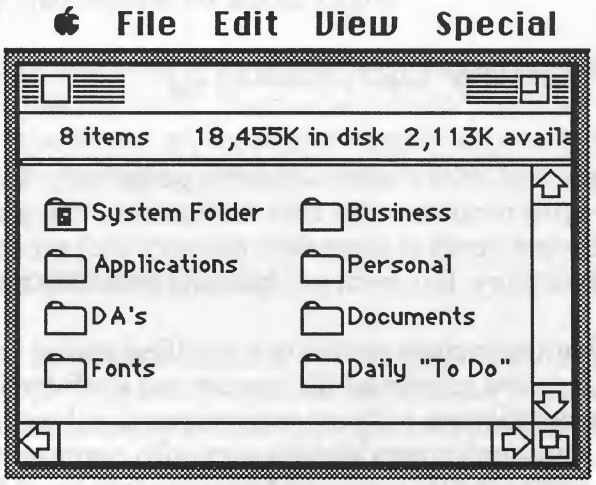
A typical window of a hard drive may look like the one shown above. For windows with a limited number of folders and files, this may not be bad. Imagine, however, 50 or 100 folders all scattered throughout the window in disarray. Finding a folder would be a time-consuming task.

Mac file organizations

Apple has provided two ways to clean up a window using keyboard commands.

The first method of window housekeeping can be finished in short order using the *Clean Up Window* or *Clean Up* command under the *Special menu*. Personally, I do not like the *Clean Up Windo*w command since it does not always place files and folders in a neat and organized order. To align folders and files like the window shown in the bottom figure on the next page, you must set your *View* menu to *Small Icon* and use the *Clean Up* command as shown on the next page.

The *Clean Up* command is not visibly present under the *Special menu.* To access this command, you must first hold down the Option key and then click on the *Special* menu as shown in the bottom figure on the previous page. The *Clean Up Window* command will toggle to *Clean Up*. Release the command and all folders and files will organize themselves as shown below.



Apple has also incorporated an invisible grid for each window. When you use the *Clean Up* command, all files and folders are snapped to the nearest grid line.

The second method of file and folder organization is a manual method using the mouse and keyboard. As discussed in the previous paragraph, each window has an invisible grid. The grid can be activated manually using the *Command* or ♁ *Open-Apple* key. To align folders or files to the grid, hold down the *Command* key and click and hold the mouse button down on the folder you would like to move. Then drag the folder to the approximate area you would like it to be placed and let go of the mouse button. The folder will snap to the nearest grid line and automatically align itself with other folders or files on the same vertical and horizontal grid line.

Apple IIGS file organization

Unfortuneately, the Apple IIGS does not contain the identical hidden grid features as the Mac. The lack of these features cause more work for you to achieve the same type of organized window. An organized window can be achieved by dragging each file or folder to the approximate location where you would like it to reside. Then choose *Clean Up* under the *Special* menu.

Organize by partitioning

At one time, hard drives were expensive peripherals. The purchase of a 20 megabyte drive meant a major cash investment. Many cost-conscious business owners opted to share their memory with others in the company. Sharing of memory, however, produced its own difficulties.

Some difficulties include requiring a specified saving format. Other problems included accidental file erasure and confidentiality concerns. Hard drive partitioning software was created to solve these and other problems. Partitioning provided the user with a way to break up a hard drive into many smaller portions of memory that could be allocated for different types of information or users.

There are many ways to partition a hard drive. Some of the most common approaches include partition by: person, organization, software and data function.

Partition by person

A shared drive may be connected to a number of different computers on a network. Usually hard drives which are shared in this manner have a large storage capacity. Partitioning can split the drive into smaller portions to be used by many different individuals. From a user's viewpoint, the hard drive acts as if it were connected directly to their computer. Therefore, if an 80 megabyte hard drive is shared, each person may get a 10 megabyte partition to use for their own data.

Partition by business department

The organizational approach to partitioning separates the hard drive into functional group memory allotments. Partitions, for example, could include one for the Finance department, Accounting department and Marketing department.

Partition by software or data type

Another method of partitioning, separates the hard drive into similar software or data type segments. This would include partitions for software applications and documents or, for a more detailed approach, software types could be partitioned including: graphics, spreadsheets and word processing.

Partition for confidentiality

Many times, data stored on a hard drive is confidential and is to be seen by certain people. This is especially true in a business but could also work at home for things like birthday or Christmas lists. A hard drive partition is created to store files that require a password access. As with any password, use caution when assigning a password to your partition. Pick a word or key combination that you will remember. Forgetting the password, usually means extra frustration to retrieve your data.

Partition disadvantages

Hard drive partitioning is not always the best approach to organizing a hard drive. If you are looking for reducing the number of mouse clicks you have to do in any computing session, partitioning will not help you here. In fact, many times you are required to open a partition using partitioning software.

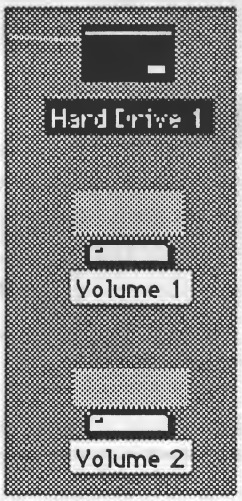
Partitioning also has a tendency to increase the fragmentation of a hard drive. A drive which operates at optimum performance has all software and data files stored sequentially on the drive's disk. This reduces the movement of the read/write head. If a drive is fragmented, the read/write head must move back and forth across the magnetic disk to store or retrieve data. This excess movement slows the speed of the drive. The more fragmentation a drive sustains, the slower the read and write times to the drive.

Partitioning a hard drive, accentuates the fragmentation process since you are essentially dividing the drive's memory into smaller portions. If partitioning is performed after a drive has many software applications and data files already stored in memory, this fragmentation is aggravated even more. This is because the computer must search for free memory space on the magnetic disk to satisfy the partition memory requirements. The location of the free memory may be on many different track and sectors.

If you are planning on using partitioning software, it is best to partition immediately after the hard drive has been formatted and initialized.

Formatting and initialization produces an essentially data free disk ready to store software and data files. Before formatting a hard drive, always back up the information you would like to keep. The information can then be copied back to the hard drive after the formatting procedure is finished.

A multitude of partitions also have a tendency to clutter the desktop. This actually adds to a disorganized approach to data storage and retrieval. If you have decided to partition your hard drive into many smaller segments, do not try to open all partitions on the desktop at the same time. Open only those that are to be used. When you are finished with a partition, drag it into the trash. This removes the partition from the desktop.



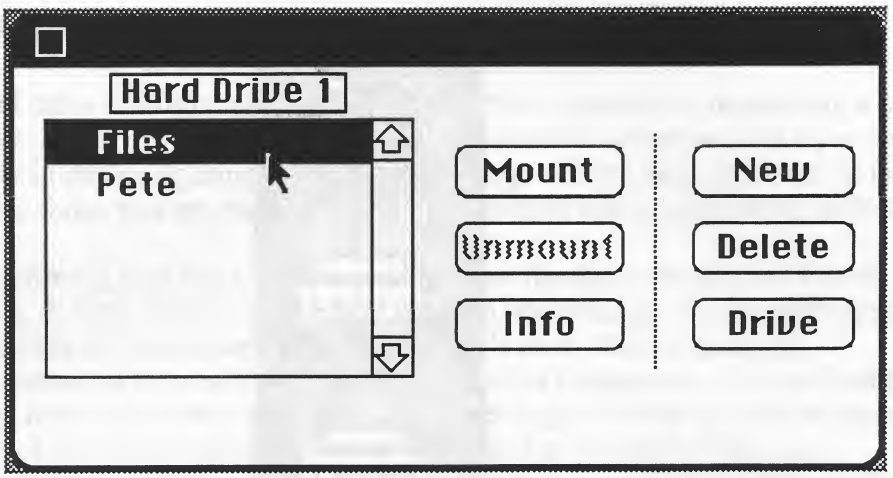
Partition example

The illustration above shows the initial hard drive volume and two partitions on the desktop of a Macintosh. However, this could also be on the desktop of an Apple IIGS.

The top volume called Hard Drive 1 is the initial volume that was created during the initialization process of the hard drive. As we have discussed in chapter 3, the initialization process creates three different files. For the Apple IIGS, these are the Finder.Data file (also known as the file directory), Finder.Root file and disk directory. For the Macintosh, these are the file directory, disk directory and the Desktop file. The purpose of these files is to keep a running status of the hard drive and all files and software applications stored on the drive. When the three files are created, the icon for the volume appears on the desktop of the computer.

Mac specific

To create a the Volume 1 and Volume 2 partitions using the partition desk accessory as shown on the next page, click on the New button. A second window will appear which asks you for the partition name and size. The size is set by sliding the elevator box on the memory scroll bar. When



finished with the memory selection, click on the Create button. The partitions, Volume 1 and Volume 2 will appear in the partition list window under Files and Pete as shown above.

For the partition to appear on the Desktop, it must be mounted by clicking on the Mount button.

Partitions can be removed from the desktop just like floppy disks. They can be dragged into the trash. Most partition software applications use a desk accessory to access the partitions.

Apple IIGS specific

An Apple IIGS hard drive can be partitioned using either the Apple II SCSI Card Utilities disk or the Advanced Disk Utility program on the Apple IIGS System Tools disk. Partitioning of the drive is executed after you have formatted and initialized your drive. This is primarily because during the partition process, the Advanced Disk Utility program erases all the data on the drive. The general rule to follow when partitioning an Apple IIGS hard drive, is to plan your partitions in advance. This includes name, size and number of partitions on the drive. Once you have partitioned the drive, you cannot add, delete, resize or rename a partition. Any partition modification requires that you format and initialize the hard drive and then choose your new partition configuration.

Partitioning of a hard drive for use with and Apple II or IIGS computer has two key advantages.

Advantage 1

Each partition you create can be used with a different file system. Therefore, if the hard drive is shared on a network of Apple II and IIGS computers, the hard drive could have a partition for ProDOS and ProDOS files and another for GS/OS and GS/OS files.

Advantage 2

If you are using the ProDOS file system, partitioning takes full advantage of a hard drive that has more than 32 MB of memory storage. By default, the ProDOS file system limits the volume size to 32 megabytes. If your hard drive has a higher storage capacity, partitioning can reclaim the wasted space by segmenting the memory into 32 MB allotments.

Partitioning a hard drive using the Advanced Disk Utility program has three key advantages over use of the Apple II SCSI Card Utilities.

Advantage 1

The Advanced Disk Utility program enables you to partition the hard drive for use with different file systems such as GS/OS and ProDOS.

Advantage 2

The Advanced Disk Utility program expands the total number of partitions allowable on a single SCSI card. It allows a total of 7 partitions for each card, whereas, the Apple II SCSI Card Utilities program allows a total of 2. This provides more flexibility for you.

Advantage 3

The 7 partition limit enables you to take advantage of storage space on a larger hard drive that may have been wasted under Apple II SCSI Card Utilities partitioning. For example, if you have an 80 MB hard drive con-

nected to the SCSI card, the Apple II SCSI Card Utilities program can use 64 MB of the 80 MB hard drive since only 2 partitions of 32 MB are allowed. The entire 80 MB can be used with the Advanced Disk Utility.

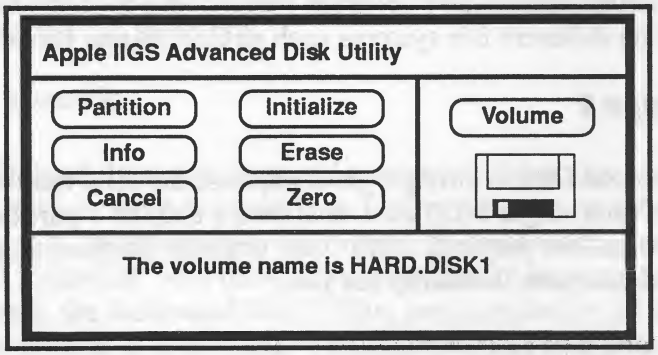
Let's create a partition called Documents on HardDisk1:

1. If you do not have the System Tools disk inserted into the floppy disk drive, insert the disk at this time.

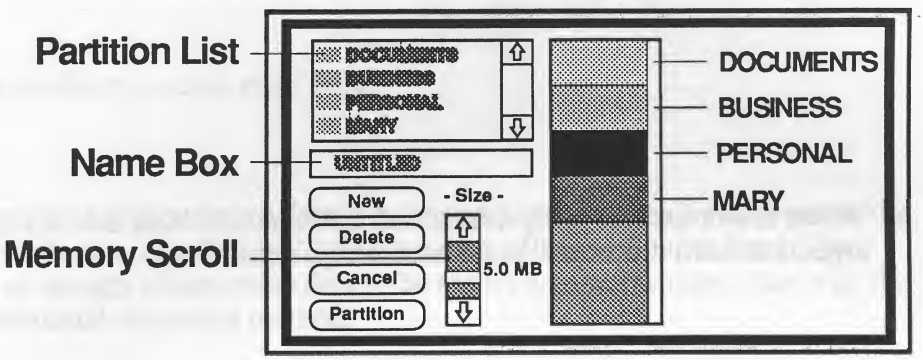
2. Open the System Tools disk by double-clicking on it.

3. Open the Advanced Disk Utility program (ADV.DISK.UTIL) by double-clicking on it.

4. When the first screen appears, as shown below, locate HardDisk1 by clicking on the Volume button in the Advanced Disk Utility window until the HardDisk1 volume icon appears. Once a icon appears, the Partition button will change from gray to black. Click on the Partition button. If HardDisk1 has not yet been initialized, a message will appear which states, "Uninitialized or no disk drive."



5. The second window, as shown below will appear. The first step is to name the partition by typing "Documents" in the Name Box. If other partitions already exist, these will also be listed in the Partition List window.



6. The next step is to set the partition size by using the Memory Scroll bar. To set the size, click on the arrows or use the elevator box to select the memory size for the partition.

7. Once you are finished with the partition name and size, click on the Partition button to create the partition.

8. To create additional partitIons, while in the partition window, click on the New button.

9. To delete a partition you have created, while in the partition window, click on the Delete button.

10. When a number of partitions are created, the Advanced Disk Utility program will graphically display the partitions on your hard drive as shown above.

Chapter 9
Tips & Information

Below is a collection of tips, facts and information about the varioius aspects of hard drives and associated peripherals.

Tape backup

The streaming method

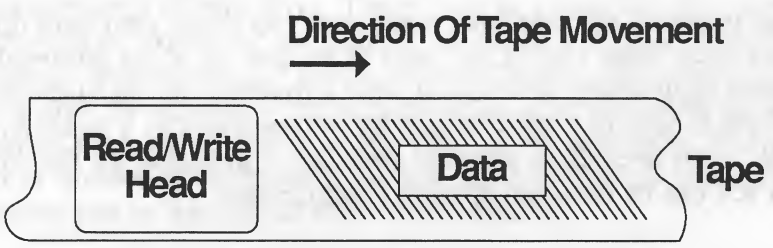
Some tape backup units use a streaming method of backing up data. Streaming means that data is stored on the tape in a serial fashion as it passes the read/write head as shown. This is different from hard drives that store data randomly from sector to sector across the disk. Therefore, a tape drive uses a different method for backing up data incrementally. It is called

an *audit trail*. Each time you choose to backup your data, it appends it to the previous backup without erasing or writing over the previous version of the data. Therefore, each revision of a document would be backed up on the tape and could be retrieved.

The helical scan method

Helical scan drives record data in a diagonal fashion along the length of the tape as shown. The diagonal runs the width of the read/write head. This type of storage allows more data to be stored on one cartridge than with the conventional streaming method.

The Helical Scan Method



Peripheral device drivers

Your computer must have some way to communicate and recognize peripherals. In order to do this, it requires a device driver. A driver is a program that tells the computer specific information about the device to be activated: its location, how to communicate with it and how it should get mounted onto your desktop. During the formatting of hard drives, tape

drives or floppy disks, the computer places device driver information on the storage medium of the peripheral to be used by the computer. The device information is called the SCSI driver and SCSI boot blocks.

During startup, your computer looks for all connected peripheral devices by reading information from each device driver. This driver information is then loaded into the computer's memory.

In the case of floppy disks, that can be inserted into the disk drive after startup, Apple included a separate program that is in Read Only Memory which tells the operating system to continually look for a floppy insertion. When a floppy disk is inserted, the device driver information is loaded into Random Access Memory.

Backup recommendation

If you want to keep your data safe, it is suggested to do a global backup once a week and an incremental backup every day.

Before you back up your data, make sure you check your hard drive for viruses since these viruses will also be backed up, if not removed. A software application called SAM from Symantec for the Macintosh is excellent at detecting and eliminating viruses quickly. Virus RX, a public domain virus dectection software package, is available for the Apple IIGS. Virus RX can be obtained through CompuShare.

Removable cartridge drive recognition

As we have explained, the computer's ROM and operating system work together to constantly look for the presence of a floppy disk inserted into the disk drive. However, for removable cartridge drives, this is not true since no program code is built into ROM to look for cartridge insertion into a drive. Therefore, the responsibility for letting the operating system know that a cartridge is being inserted into the drive is left up to the manufacturer of the drive. This recognition is accomplished by using a program called an

INIT (which is an abbreviation for initialization). During computer startup, the INIT program is loaded into RAM. The operating system relies on the INIT program to constantly watch for the insertion of a cartridge in the drive. If an insertion is detected by the INIT, the operating system can then get the device driver from the track and sector location on the cartridge and load it into RAM.

Hard drive speed tips

If you have noticed that your hard drive is getting slower and slower, you may be right. Here are a few tips to help your hard drive get the lead out.

Reformat the hard drive

As discussed in the chapter on Sector Interleave, all computers have a specific interleave ratio they operate under when transferring information from the computer to hard drive. There must be a match in this interleave ratio between the computer and hard drive for the system to operate at peak performance. Remember, the interleave is defined as the number of magnetic disk revolutions in the hard drive required to read or write all the information from the computer to one track of the hard drive. The fewer number of revolutions required to transfer the information, the faster the information can be transferred from the computer.

A mismatched interleave ratio between the computer and hard drive will affect the transfer performance drastically. If the two are not matched, the hard has to complete an extra number of revolutions over the specified interleave ratio to complete the information transfer.

To ensure superior transfer rate performance, use the formatting software that was provided with your hard drive and reformat the drive. During formatting, you will either choose the proper interleabe ratio or the computer will set the ratio for the hard drive automatically.

Reorganize the hard drive

Sometimes a slow hard drive is partially caused by poor organization of files and folders. Since the Finder must keep track of the file and folder locations, it makes sense that it would take longer to open a folder with 100 items versus a folder with only 25 items. In the Hierarchical Filing System (HFS), folders can be put into folders. While these folders may contain multiple items, they are treated by the Finder as only one item until opened. Therefore, if speed is what you are after, use nested folders and keep the number of items per folder to no more than 25.

Mac tip: rebuild the desktop

If you find the execution of commands and housekeeping chores slowing down while on the desktop, you may be suffering from Finder fatigue. When a large amount of information about your desktop must be stored, the computer slows trying to store and retrieve all the information about file location, window position, windows open or shut, folder locations, icon locations, Get Info commands and on and on. Suddenly, copying a file to the hard drive may take minutes instead of seconds.

The answer to your computer's sickness lies with the Desktop file. The Finder slows as the Desktop file grows. This means it's time to rebuild or compress the Desktop file.

To rebuild the Desktop file, you must complete the following steps.

- First, restart your computer by clicking on the Restart command under the Special menu.
- While your computer is booting, hold down both the Option and Command keys.
- A dialogue box, similar to the one on the next page will appear.
- If you would like to rebuild the Desktop file, click on the OK button.

Remove fragmentation

Another way to speed up the operation of your hard drive is to remove fragmentation. Over time, all hard drives suffer, to some degree, from fragmentation. As we have discussed, data is stored in sectors on the magnetic disk of the hard drive. During the writing process, once a sector is filled with data, the read/write head must search for a new sector. This sector may not be sequentially next to the previous sector. It may be located in a completely different track of the disk. This tyupe of hunt and peck is quite common during a writing operation. When a multitude of files become strewn over the different tracks of the hard drive, the hard drive becomes fragmented. Fragmentation slows performance of the drive by forcing the read/write head to move an excessive amount of times from track to track.

Remove fragmentation for Macs

You can determine the percentage of fragmented files on your hard drive by using a software application especially designed for this task. DiskExpress from ALSoft and HD Tuneup (part of the SUM II utilities program) from Symantec are designed to easily and efficiently remove fragmentation from your drive. These programs search for files which have sectors which are not stored sequentially. Once found, they report the percentage of files fragmented to you. If you choose to fix the fragmentation, they will move the sectors of a file to a new position on the magnetic disk in a sequential order. Remember to back up your data before performing a hard drive tuneup to prevent accidental loss of data.

Remove fragmentation for the Apple IIGS

To remedy the fragmentation problem on an Apple IIGS hard drive, requires the following: 1) manual backup of data, 2) reformat the hard drive and 3) load all backed up files to hard drive. By removing the data on the hard drive, reformatting the drive and loading back again to the drive, you are enabling the read/write head to store the data in sequential sectors on the disk.

Maintenance and storage tips

Backup

Always back up both your software applications and files you have stored on your hard drive. An intensive computer user should execute an incremental backup on a daily basis. A moderate computer user should back up at least once a week. Critical data you have created and have stored on your hard drive, should be backed up twice. This helps to ensure data will not be lost. Sometimes backup software can become corrupted which would affect the integrity of the back up floppy. For this reason, make the first backup copy using your backup software. Then make the second backup copy manually by dragging the file with the critical data to a floppy disk.

Storage

Store all of your original software applications and backed up data in a safe, cool place. Investing in a small fire proof safe is a good idea. These small safes are not expensive and will help protect your data in case of fire.

Copying versus dragging

When backing up your data, make sure you understand the difference between copying and dragging data files. A file is copied if it is dragged from one physically separate disk to another. For example, dragging a file from your hard drive to a floppy disk will copy the file to the floppy. Dragging a file from one floppy to another floppy will also copy the file. Dragging a file between folders on a hard drive or floppy disk will not copy the file. This only moves the file to a new location in the window. The Desktop file will be updated but the file is not copied.

Special menu commands

Cultivate the habit of using the *Restart* and *Shutdown* commands under the *Special* menu for both the Mac and Apple IIGS. This ensures that the file directory, disk directory and Desktop file are properly updated before you shut the computer off. The *Shutdown* command may also park the read/write head of the hard drive. Parking ensures the head is away from the magnetic disk. This eliminates the possibility of a head crash into the magnetic media. A crash like this could result in permanent loss of your data on the drive.

Be sure you understand how to use the Erase command under the Special menu if you are a Mac user, and the Remove, Erase, Zero and Initialize command under the Special menu if you are an Apple IIGS user. These commands perform different types of operations and should be understood before using. The Erase commands for each computer will remove the file directory information but not the data on the disk. If the data is present on the disk, a software application which recovers lost data could be used.

The only "fatal" and permanent removal of data is the Zero command in the GS/OS software for the Apple IIGS. Zeroing not only removes the file directory but all of the data on the disk. If you are unsure about which command to use while computing, it is best to resort to manually dragging any of the files you would like to remove into the trash.

Disappearing files and folders

If any files on your hard drive suddenly disappear, immediately shut down the computer. Then reboot the computer using a floppy disk which contains the System and Finder on it. Try to recover the files you noticed disappear or perform a global or incremental backup. For recovery use LifeGuard for the Apple IIGS or SUM II for the Mac. DO NOT transfer any file to the hard drive or even move any files or folders before you try and recover the lost files. This may cause the read/write head to write over the sectors which contain the file you are trying to restore.

Mac: Speed software application launch

If you would like to decrease the launch time of any software application you use, try the following procedure. Trash your favorite or most-used software applications and then recopy these same applications back to the hard drive in order of use. The software application you use the least should be copied first, continuing down the list, until the software application that is used most often is copied last. When you double-click on your favorite software application, the Finder will look into the Desktop file to find the application. The Desktop file lists applications and files in the order in which they were loaded or created on the hard drive. If you loaded your favorite software application awhile ago, the Finder will have to look through a long list of information before it gets to the one you are requesting. Loading the most-used application last, ensures the application is at the top of the list in the Desktop file. If it is at the top of the list, it will be found quickly by the Finder.

Buyer's guide recommendations

Before purchasing any type of hardware or software, find out all you can about the product. Research can be accomplished by using the following guidelines below.

1. Call us at CompuShare.

2. Call the company and request information about the product.

3. Read about the product in the respective computer magazines. Mac users can choose from MacWorld, MacUser, Macintosh Hands On and User Group newsletters. Apple IIGS users can choose from: inCider/A+, Nibble, Call APPLE, The CompuShare newsletter and other User Group newsletters.

4. If you can't find an article about the product you are interested in, contact the particular computer magazine and find out if a back issue of the magazine has an article about the product of your interest.

5. Talk to friends who are knowledgeable in computer software and hardware.

6. Make a list of your personal requirements for the software or hardware.

7. After obtaining product brochures, call the company and ask specific questions about your requirements.

8. Talk to a salesman at your local computer store.

Product recommendations

File recovery software

Apple IIGS

LifeGuard
$59.95 List
Harbor Software
403 Great Road, Suite 8
Acton, MA 01720
(617) 263-1870

Macintosh

1st Aid Kit, HFS
$99.95 List
1st Aid Software
42 Radnor Road
Medway, MA 02135
(800) 843-3497

SUM II
$99.95 List
Symantec Corporation
10201 Torre Avenue
Cupertino, CA 95014
(408) 253-9600

PC Tools/Mac
$79.00 List
15220 N.W. Greenbrier Pky.
Beaverton, OR 97006
(503) 690-8090

Backup software

EasyDrive
$69.95 List
Quality Computers
(313) 331-0700

DiskFit
$99.95 List
SuperMac Technology
(408) 245-2202

Fastback II Mac
$189 List
Fifth Generation Systems
(800) 873-4384
(504) 291-7221

Retrospect
$249 List
Dantz Development Corp.
(415) 849-0293

ImageWriter II maintenance

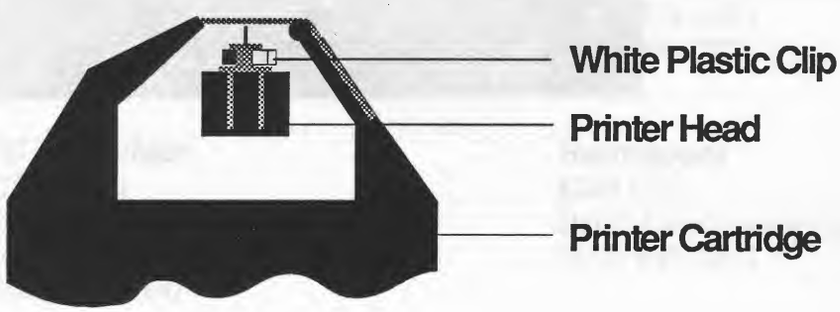
Chapter 1
Print head maintenance

Maintenance

If the quality of your printed output is light or characters smear or print unevenly on a dot matrix printer, it may be time to clean the print head. Sometimes a dirty print head prevents the pins of the head from properly striking the ribbon.

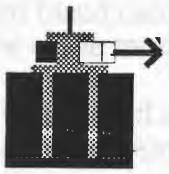
The section below provides step-by-step instructions to clean the print head of an ImageWriter II.

1. Turn off and unplug the ImageWriter.
2. Remove the top cover.
3. Locate the print head between the white plastic clip by the platen and the ribbon cartridge as shown.



4. Remove the ribbon cartridge.

5. With your right hand, push the white plastic clip to the right and hold it in that position as shown below.

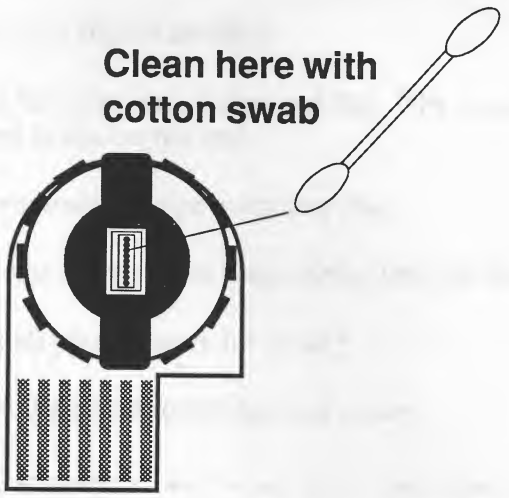


6. With your left hand, pull the print head out of the printer.

7. Turn the print head towards you, as shown below.

8. Locate the nine print head pins on the black plastic bar.

9. Use a cotton swab to gently dab at the print head pins and the surrounding area as shown below.



10. Hold the print head in your left hand with the head facing away from you.

11. Push the white plastic clip to the right with your right hand and hold it there.

12. Load the print head circuit board into the socket, so that the black plastic bar is in front of the white plastic clip.

13. Push down on the print head gently. Do not force it. The insertion process is sometimes difficult and requires patience.

14. Snap the print head into place and replace the ImageWriter's top cover.

15. Test the print quality. This can be accomplished by holding down the *Select* button while turning the printer on. The *Select-On* button combination puts the printer in print test mode.

Chapter 2
General cleaning

Cleaning the insides

As you use your ImageWriter II, dust and paper fibers become trapped inside the printer. Over time, these mix with the lubricants of the printer to form a "gummy" substance. If this substance is not removed, it can cause operational failure and broken parts.

There are many ways to remove dust and dirt: a micro vacuum, clean brush, a small can of compressed air or a lint-free cloth. Here's a few steps to take to keep the insides clean:

1. Make sure the printer is turned off and unplugged.
2. Remove the ribbon cartridge.
3. Inspect for locations of dust and dirt. Dirt is particularly attracted to the carrier rod.
4. Blow, vacuum or wipe away any dust.
5. Inspect the rubber print head carrier belt for wear.*
6. Inspect all plastic gears for wear.*
7. Replace the ribbon cartridge and cover.

* *If you notice signs of significant wear on any of the items above, it's time to take your printer into your Apple dealer for technical service.*

Cleaning the outsides

The plastic case of the ImageWriter II can be cleaned with ordinary dish detergent and a damp cloth. Do not use any type of household cleansers, ammonia, powders, abrasives or solvents as these will usually wipe off the printer's texture.

Chapter 3
ImageWriter tips

Printer Ribbons

Whenever you insert a new ribbon or, put a blank address label on them marked with the date of installation. With average use ribbons should last two months, and toner cartridges should last at least three months. Individual results may very. If you print a lot of graphics, the ribbon or toner cartridge will usually have a shorter life.

Printer advancement

If your dot matrix printer does not advance paper properly or prints on top of printing, you may want to check the paper release/pin-feed lever. The lever should be in the down position. Also check the fit of the paper on the tractor feed pins and check the printer settings in the Control Panel.

Colored ribbons

When using a colored ribbon in a dot matrix printer, the top half of characters print in one color and the bottom half in another:

Check the ribbon cartridge position. It may not be installed completely.

Check the ribbon cartridge's vertical position. Most dot matrix printers have a vertical adjustment knob or ring that adjusts the height of the ribbon.

To change the ribbon's vertical position in the ImageWriter II:

1. Remove the printer's top cover.
2. The position marker/ribbon adjustment ring is located to the right of the ribbon cartridge.
3. Release the red ring by pushing down on it.
4. If the unwanted color appears at the bottom of the characters, raise the ribbon's position by turning the red ring clockwise.
5. Turn the ring counterclockwise if the unwanted color is on the top.
6. To properly gauge the amount of ring rotation, the position of the ribbon will move .014 rotations in either direction.

Labels get stuck inside your printer

Whether you use a laser or dot matrix printer, lay the label sheets on a flat surface and run your hand over them. This will ensure they are properly adhered to the backing and will be less likely to come off the paper and stick to the machine.

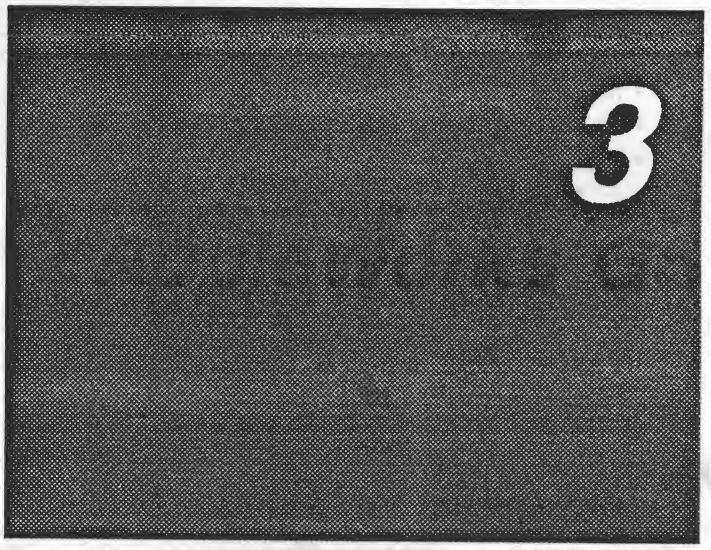
Printing in foreign languages

Change the Control Panel settings in the Display Language and Keyboard Layout sections to the desired language.

Configure the ImageWriter II to accept the foreign language:

1. Turn off and unplug the printer.
2. Remove the top cover.
3. Locate the two sets of DIP switches inside on the lower left of the printer.
4. Change the DIP switch settings according to pages 70 and 71 of the ImageWriter II printer manual.

AppleWorks GS



Chapter 1
AppleWorks GS 1.1

This special report gives an overview of the improvements in AppleWorks GS 1.1, as well as gives a look at the original package, AppleWorks GS.

- Full compatibility with Apple IIGS System software 5.0
- Full compatibility with the new 1 MB Apple IIGS (1.125 MB version)
- Imports AppleWorks 3.0 files
- Memory test utility
- Database conversion utility
- ImageWriter printer driver
- 1" mailing label template
- "Contains", "Begins", "Ends" functions
- Graphic Control Panel
- Accent and diacritical marks: é, è, î, ñ, ü
- Special characters: ¶, , ™, ®, , ç
- Spell checker command keys

Database conversion utility

The Claris team has provided a database conversion utility to translate AppleWorks database files to AppleWorks GS format. If you use the conversion utility, keep in mind that the new database file will be a bit larger than the original due to the different formats.

Diagnostics

The Diagnostic utility, used via "About AppleWorks GS..." under the Apple menu, lets you see how much RAM is available while in AppleWorks GS. You can also get information on the ROM and System version numbers with the Diagnostic utility. Hard drive users can use the Diagnostic utility to unfragment memory blocks.

AppleWorks GS 1.1 makes it easier to do spell checking with the addition of command keys. Spell checking a document goes much more quickly when you use command keys, rather than navigating through the menu system with the mouse.

Other benefits

- AppleWorks GS 1.1 loads about eight times faster than Apple Works GS 1.0v2.
- System software 5.0.2 is included in the upgrade package.

How to order AppleWorks GS 1.1 update

Current registered users of AppleWorks GS should have received an upgrade packet. Claris has a toll-free number for packet or phone orders: 800-628-2100, ext. 21 (8:30-5:30 PST). If you are placing an order, you will need your Visa/MasterCard number and expiration date, as well as your AppleWorks GS registration number. You can ask for an order packet if you prefer mailing in your order, but be prepared to wait about three weeks. It will probably only take a week to get the upgrade via a phone order. AppleWorks GS 1.1 is free to those who purchased AppleWorks GS 1.x on or after September 15, 1989. Add $3 shipping/handling and your local state sales tax if you are paying for the upgrade.

Chapter 2
AppleWorks GS*

It all started with the bright people at StyleWare, makers of MultiScribe and MultiScribe GS, TopDraw, DeskWorks and Font Library for the Apple II computer. Convinced that the desktop environment was the new industry standard for the Apple IIGS, Kevin Harvey, President of StyleWare, decided to produce an integrated package for the IIGS as competition for AppleWorks. GSWorks was the result of that progressive thinking. Eventually, Claris purchased StyleWare and all its products. Kevin Harvey moved to California to coordinate the completion of GSWorks or, as it has been renamed, AppleWorks GS. According to Mr. Harvey, GSWorks was close to the alpha testing phase when Claris bought it. The original feature set was retained with a few minor features added. Claris put its larger product support capability behind the product and maintains that support now that the product has been released.

AppleWorks GS is an ambitious combination of six major functions: Word Processing, Database, Spreadsheet, Graphics, Page Layout (Desktop Publishing) and Communications. Documents from different modules can be open at he same time. Text and graphics can be transferred between these documents. With AppleWorks GS, the IIGS user can access the most-used personal computer functions from within one convenient application!

* *This portion of the AppleWorks GS report refers to AppleWorks GS 1.0 and 1.0v2. Refer to the two previous pages for an overview of AppleWorks GS 1.1.*

Word Processor

The word processor module is a full function, multi-font, multi-color graphic word processor. The module can import AppleWorks GS word processor files, AppleWorks 2.0 word processor files and ASCII text files. The module also includes merging capability with database data to create such things as form letters.

Database

The database module provides all the features necessary for creating and manipulating information. The module supports text, numbers, calculations, graphics and forms generation. You can customize the form in which these fields will be arranged using the graphical definition screen. This module also includes a reporting function, which produces text reports for exporting to the word processor module. AppleWorks database files can also be imported into an AppleWorks GS database.

Spreadsheet

The spreadsheet module is both full-featured and easy-to-use incorporating intelligent cell calculation. Again, AppleWorks 2.0 spreadsheet files can be converted into the AppleWorks GS spreadsheet. The spreadsheet calculations can include both standard mathematical operators as well as logical operators and paste functions.

Graphics

The graphic module is a super high resolution paint and draw program than can import standard graphics including those produced by Deluxe Paint II, PaintWorks Plus, and PaintWorks Gold. All graphic objects created or manipulated in the graphics module are directly transferable to the database and page layout modules either by dragging from window to window, cutting and pasting to the clipboard, or by importing.

Page Layout

The page layout module is a terrific accomplishment and brings the ability of desktop publishing (DTP) to the IIGS. In this module, text handling is surprisingly quick and reliable. You can link text from column to column and even across pages. Other features include text and graphics import capabilities, text editing, and a set of graphics tools.

Communications

The communications module opens the world of telecommunications to anyone with a modem. The user interface of this module is nicely designed with clear dialog boxes that display the necessary hardware and communication information, including a phone directory. You can upload and download files using any of the standard protocols and the Binary II file format.

Summary

Don't expect this complex package to be a top notch productivity tool. The product is hampered by its memory requirements, complex interactions with the operating system, and bugs in the programming. AppleWorks GS is a version one release and does have some very basic problems that are currently the subject of lively discussion among users and developers. However, the application takes full advantage of the IIGS 16-bit system architecture and runs under the new IIGS operating system, GS/OS. AppleWorks GS maintains the mouse-driven desktop environment that we enjoy and expect in IIGS applications.

Chapter 3
Using AppleWorks GS

The minimum system requirements to run AppleWorks GS are an apple IIGS with a minimum of 1.25 Megabytes of memory (basic memory PLUS 1 Megabyte on an expansion card) and one 3.5 inch disk drive, although two drives provide a more convenient configuration. Due to the memory intensive nature of this application, the best system configuration requires as much memory as you can afford (more than 1.25 Megabytes), a hard drive and 3.5 inch disk drive. This may be the primary drawback of AppleWorks GS. The additional investment of memory and hardware quite naturally induces hesitation in a potential user. Owners of the new 1 Megabyte Apple IIGS do not have to worry about minimum RAM requirements. The new computer has 1.125 Megabytes of RAM and a more efficient ROM chip. So, although AppleWorks GS needs 1.25 Megabytes RAM, the new Apple IIGS's configuration makes its memory adequate for most users.

Installation

After you have sent in your registration card, make backup copies of your program disks, and prepare formatted disks for storage. You should read the special installation information in the AppleWorks GS Reference manual and the AppleWorks GS Update. It is very important you follow these instructions. Due to the memory intensity of AppleWorks GS, RAMdisk memory requirements can cause conflict with AppleWorks GS and some very unpleasant problems. The RAMdisk can be removed through the Control Panel. The procedure for doing this is described in the AppleWorks GS Update document.

The Font folder in the System folder of the AppleWorks GS System disk contains 31 different fonts or font variations. You can insert or delete any IIGS font into this folder, but make sure that the Geneva 12 and the Monaco 9 fonts remain in the folder. AppleWorks GS requires these fonts for the proper operation of the word processor, page layout and communications modules.

To install AppleWorks GS on a hard disk, simply copy the three AppleWorks GS disks into separate folders inside an appropriately labeled folder on your hard disk. Place the Font folder inside the System folder of the hard disk. During the startup process, the AppleWorks GS application, the program will look in the hard disk System folder to find the fonts.

After the application is loaded, you are presented with the familiar desktop environment and a large multi-colored dialog box. This is the heart of AppleWorks GS. From here you can jump to any of the six separate modules. Six of the seven colorful icons displayed in the dialog box correspond to the six modules. The purpose of the icons is to provide a method for selecting module type and associated file to be opened. If the module combination icon is selected, all files in the current folder are displayed in the file window of the dialog box. Selection of any one of the six module icons will only show files that were created by that module. Opening a file instructs AppleWorks GS to load the selected file and corresponding module (word processor, database, etc.). If you wish to open a new file, select the icon corresponding to the module you wish to use and then click *New* . Multiple modules and files can be opened and displayed on the screen simultaneously.

Word processor

The menu bar lists seven menus. Just below the menu bar is a yellow ruler with eight icons that control line spacing (single, line-and-a-half, and double), text justification (left, right, center, and full) and paragraph locking (to prevent splitting of a paragraph over a page division). Three tab wells are located in the center of the ruler. It is from these that you can select left, right or decimal tabs. The ruler has left and right margin markers, and an indentation marker for indenting the first line of a para-

graph. These markers and tabs are set, moved, and removed very simply with the mouse. The ruler markers can be changed at any time during editing of a document. Those changes remain in effect for the remainder of the created document unless another ruler change is implemented later in the document. Previously created text can have the rulers changed by highlighting the text and changing the ruler.

A blinking text cursor waits at the upper left corner of the document window (or wherever it was when the document was last saved), and the mouse cursor appears whenever the mouse moves. The word processor supports the standard Apple User Interface Guidelines, which means you can manipulate text by keyboard entry, or by pointing, clicking and dragging the mouse.

Menus

The ***File*** menu is standard throughout the six modules providing file manipulation and printing capabilities. A different combination of commands are available for each module. All commands function identically from module to module with the exception of the *Save as...* command. In the word processing module, the *Save as...* command provides the capability to save the document in AppleWorks GS format or ASCII text only, without the formatting information. The *Import file* command is used for adding word processing files or ASCII text files to the current document. When this command is selected, the standard file access dialog box appears on the screen for the selection of the file to be imported. The *Print merge* command is used in conjunction with other pertinent menu commands for the printing of multiple copies of documents, such as form letters that contain one or more records. A dialog box is provided for keeps the user informed during the printing process.

The ***Edit*** menu includes *Undo*, *Cut*, *Copy*, *Paste*, and *Clear* commands. This menu also features commands for the copying and pasting of the ruler anywhere in the document, and for selecting ranges of text (All, Paragraph, or Sentence) without using the mouse. The last two commands in the *Edit* menu are used to select a record from an open database document for merging into the current document. These commands work together with the *Print merge* command in the *File* menu.

The ***Search*** menu provides a versatile search/replace function. You can choose case sensitive mode and direct it to search for complete words only. The dialog box also has buttons for *Replace, Then Find*, *Replace All*, and *Go to Beginning*. The *Go the Beginning* option starts the search at the beginning of the document rather than the current insertion point. The search function can locate carriage returns and tabs if the appropriate key is entered by pressing *Option* with the desired key. The *Search* menu also provides a *Go To* function that automatically moves the text insertion point to the beginning, end, or a specified page of the document. The *Go to Insertion* command scrolls the window to the current insertion point.

One of the advanced features of the word processor is the spell checker. The spell checker is accessed through the ***Search*** menu and contains an 80,000 word dictionary that is used to detect misspelled words, doubled words, errors in capitalization, and errors in punctuation. AppleWorks GS also has a user dictionary for adding proper names and/or technical terms to the spell checker. This user dictionary can be edited using the *Edit dictionary* command. Both dictionaries are located on the AppleWorks GS utilities disk. AppleWorks GS also has a thesaurus and it is accessed by selecting the *Synonyms* command. The synonym function has a special meaning-based capability that determines the usage of the word you selected (noun, verb, etc.) and then provides an example of that usage and a list of synonyms that match the particular usage of the word. For example, the word "look" has a number of noun and verb uses. If you select that word in your document, AppleWorks GS will attempt to determine the correct usage and provide an example of the usage along with one or more synonyms that match.

The ***Document*** menu lets you customize your document. This menu gives you editing capabilities, as well as the ability to create headers and footers. Automatic date, time, and page number stamping are enabled by this menu when you are editing a header or a footer. The *Show ruler* command toggles the rulers visibility. The *Pages* command lets you set the initial page number of the document and define the pages to have headers and footers. The *Insert page break* command inserts a page break just before the current insertion point. The last command in this menu, *Statistics*, presents a dialog box containing the total number of characters, words, lines, paragraphs, and pages in the document.

The ***Font*** menu lets you choose the first fifteen fonts in the font folder of your startup disk. It also has a *Choose font* command, providing access to all the fonts in the System folder as well as the style and size of those fonts.

The ***Size*** menu provides 8 font sizes, ranging from 8 to 24 points. If a particular font size is present in the fonts folder, that size will be listed in bold print in the menu. Font sizes can be changed to any point size from 4 to 48 points in one point increments.

The ***Style*** menu lets you change the style of the current font to any of the standard styles: Plain, Bold, Italic, Underline, Outline, Shadow, SuperScript, and SubScript. The Word Processor module provides three additional menu commands: UPPERCASE, lower case, and Title (capitalizes the first letter of every word in the selected text range).

The ***Color*** menu includes 16 different colors. These colors look very good on the menu, but when chosen for text of certain sizes and fonts, the colors appear washed out, smudged or non-existent for some types and sizes of fonts. This is because of the way the IIGS draws colors on the screen. For best results, experiment with different fonts, font sizes, and styles when producing a document with color text. The *Color* menu also contains the *Edit* colors command which allows you to edit the color palette by varying the RGB (Red, Green, Blue) or the HIS (Hue, Intensity, Saturation) of each color.

The ***Window*** menu, which is common to all modules, lists the open files that are currently on the desktop. When only one file is open, the *Window* menu lists the name of that file and the clipboard.

Problems with the word processor module

The word processor module is possibly the most unreliable of the six modules. It can hang up or report a Fatal system error at any time, but most often when you are repeatedly cutting and pasting. Save your docu-

* *Many of these problems have been fixed in AppleWroks GS version 1.1.*

ments often and save a document in two or more separate files on separate disks. Avoid multiple cut and paste maneuvers and expect strange happenings such as:

- Disappearing rulers (Activate *Show/Hide ruler*).
- Cursors or text that don't erase properly.
- Giant copies of text that mysteriously appear in the document in a new and unselected color.
- Spontaneous invisible carriage returns.

If you save your files often, these will be minor but tedious inconveniences. It is the repeated re-boots and the occasional loss of an hours work that prevents this module from being a productive tool.*

Database

The database module provides all the necessary features for storing almost any type of information you wish including text, numbers, and graphics. This module also enables you to create customized forms. This is a definite advantage over AppleWorks 2.0! The database module can convert database files from AppleWorks 2.0 and other applications that use tab (or space) and carriage return delimitations. However, when converting files, make certain that none of the fields are hidden in the original file or those fields will not transfer. The database module also can import several different formats of graphics files.

Menus

As stated earlier, the *File* menu is the same for each module. However, in the database, the *Save as...* command provides the capability for saving the file as a delimited ASCII text file without the AppleWorks GS formatting information.

The ***Edit*** menu provides the same *Undo*, *Cut*, *Copy*, *Paste*, *Clear*, and *Select all* commands found in the word processor module. The *Edit colors* command is the same in this module as well. The commands that are unique to the database *Edit* menu incorporate field and record options. By choosing the appropriate menu command, you can re-define a field, format, or formula using the appropriate dialog boxes. The *Insert a record* command performs new record insertion before the current record.

The ***Organize*** menu helps you organize fields. The *Find*, *Find next*, and *Replace* commands resemble the find and replace functions of the word processor, but they work on fields rather than words. The *Match records* command allows you to select all records that meet a specified set of conditions. The set of conditions is similar to a formula but is really a logical expression composed of fields, operators and functions. The matching records are then selected (highlighted) on the screen. The selected records can then be hidden using the *Hide selected records* command or the unselected records can be hidden using the *Hide unselected records* command. The *Show all records* command returns you to the forms screen.

The *Mark fields* and *Unmark fields* commands cause selected fields to be shaded (marked). *Display marked fields* hides sensitive fields from view. *Unmark Fields* returns the fields to view.

The *Sort...* command sorts active (non-hidden) records according to the value of certain fields inside records. This function allows the sorting of records alphabetically, numerically - in ascending order or descending order and multi-level sort. The *Sort...* function is surprisingly fast and easy to use.

The ***Template*** menu provides commands that control data display on the screen. The first three commands determine the types of windows displayed: *Definition*, *Form*, or *List*. The *Definition* window is used for defining each field in the record and where it is located on the form. The *Form* window shows each record as it would appear if it was printed including the contents of each field. The *List* window displays all fields for all records in tabular format. Although data can be entered using the *Form* window, the *List* window is the one to use for fast and easy data entry as well as for reviewing multiple records at a glance.

The *Open template* and *Save template* commands let you save a form as a template for many different types of data.

The *Grid* and *Grid size* commands control an invisible grid that, when activated, creates an invisible set of horizontal and vertical lines for the precise placement of fields. Each placed field will snap to the nearest horizontal and/or vertical line as if it was magnetic. The *Grid size* command enables you to select the spacing between the horizontal and vertical lines: 1/8, 1/4, 1/2, or 1 inch. No other spacing selections are available, so it is often more convenient to turn off the grid. The grid is activated automatically when a new file is opened.

Display preferences controls the way database information is displayed. The three on/off commands in the dialog box control multiple records per page, the printing of a line separating each record, and displaying of lines between cells on the *List* screen.

Return key preferences controls where the next active cell (field of a particular record) will be after the return key is hit. The default choice is the first field of the next record.

The *Choose font* command lets you choose the font, style, and character size for the entire database document. This command looks the same in all the modules. However, in this module the font style selected will be changed for a particular field by the *Field format* style selection.

The ***Report menu*** contains commands for creating and modifying reports containing database information.

The *Header* command activates a dialog box which allows you to enter a line of text to be printed at the top of each page of the report. The text may be either plain or a combination of bold, italics, and underlined. The current date and/or time may also be displayed automatically in the header.

The *Footer* command provides the same dialog box with the same options for printing a line of text at the bottom of each page.

The *Format* command activates a dialog box which allows you to enter new names for each column (field) of the report. The default names of the

columns are the names of the respective fields. In the default report format, AppleWorks GS will print the values of each field in a columnar format and print the total of each field at the bottom. You can specify that certain calculations be performed on specific columns and that sub totals be printed for those columns at specified intervals. The calculation choices are Average, Count, Minimum, Maximum, Sum, and Standard Deviation. Not all of these calculations work with all types of fields. Fields can be subtotalled whenever the value of a specified sorted field changes. You must have sorted one or more fields before this will work and you will want to experiment with this function since it is potentially confusing. If you don't choose the subtotal fields carefully, you could get a subtotal after every line in your report!

The *Summery only* command controls whether AppleWorks GS produces a full report with all the field data, subtotals, and totals, or just the subtotals and totals. Summary reports are useful when you are interested in the results of the summary calculations that you specified for each field.

The *Create report* command produces a report with all the specifications defined by the menu commands above. This report is generated in memory and appears on the screen as a word processing document in a word processing window where it can be edited and stored just like any other word processing document. The document can then be imported into any other word processing document.

Problems with the database module

As with most of the modules, if you try to work faster than the computer you are in danger of encountering a Fatal System Error or the insidious "Beep-Beep" mode. AppleWorks GS will enter the "Beep-Beep" mode whenever the module is lost and confused. This mode is characterized by a non-changing screen and a continuous beeping from the speaker! The only solution is to reboot the computer. Unfortunately, all your data that was not saved is lost. Remember, save your files often!

The database module cannot import database documents from other applications as advertised in the manual. You can convert a properly delimited ASCII file into a new AppleWorks GS database by opening it, but the *Import file...* command will not recognize any of those type files. Conse-

quently, you cannot merge a database you created with AppleWorks 2.0 into one created with AppleWorks GS.

When importing graphics into a database file, significant portions of the picture will be lost if the receiving field is smaller then the original size of the picture. This is a result of the graphic scaling function. The only way around this is to scale the picture to the field size using the graphics program that produced the picture and then transfer the file by clipboard or by importing.

Spreadsheet

The spreadsheet module provides full-featured capability that is easy to use. Whether you want to balance your checkbook or create a business budget for the fiscal year, this module can handle it. It is easy to enter data, set up formulas, and perform calculations in a way that will suit your needs. The maximum number of rows is 9999 and the maximum number of columns is 676. You can print the entire spreadsheet, a portion of it, or chart the results in a variety of graphical formats provided by the built-in chart function. AppleWorks GS converts spreadsheet files from AppleWorks 2.0 and any other application that stores spreadsheet data with tab (or space) and carriage return delimiters.

A wide variety of functions are provided for use in cell formulas. The formulas can be defined with absolute or relative cell coordinates. Most of the commands that move or rearrange cells also modify any associated formulas. However, some formulas will return a value of "N/A" in the associated cell if a cell re-arrangement adversely affects a formula definition.

Menus

In this module, the *Save as...* command saves the spreadsheet file in ASCII text form with tab/carriage return delimiters in addition to the normal AppleWorks GS format. Other spreadsheet applications can then import the ASCII format.

The ***Edit*** menu provides the standard *Undo*, *Cut*, *Copy*, *Paste*, *Clear*, and *Select all* commands, plus commands controlling the handling of cells, rows, and columns.

The *Paste format only* and *Paste values only* commands provide choice of paste operations. During a copy operation, you can choose to paste either the format or value of a cell or both. The default is to paste the value and the format of a cut or copied cell.

The *Insert* command lets you to insert a cell or an entire range of cells into a document. After selecting the cell or range of cells, activate this command, and the spreadsheet will insert the same number of cells, rows, and / or columns immediately before the range you selected. If you select a cell or range of cells that is not a complete row or column, a dialog box will appear asking you to specify in which direction (right or down) you wish to insert the cells. Any formulas that are associated with the selected range of cells will produce a value of N/A until they are redefined.

The *Delete* command deletes a selected cell or range of cells. The entire range is removed from the spreadsheet and the other cells are moved to take its place. As with the *Insert* command, if the selected range is not a complete row or column, then a dialog box will ask you which direction (left or up) you wish to delete the cells. The *Delete* command can be reversed using the *Undo* command.

The *Move* command moves a cell or range of cells to another location. After selecting the cells, activate this command. A dialog box appears and asks for the cell coordinate of the new location, or the top left cell of the new location of the range. You can also move cells by selecting the cell or cells, holding down the Apple key, and clicking on the new cell location. If you move cells on top of other cells, the original cells are not moved out of the way, they are lost! Be sure to use the *Insert* command first to make room for the moved cells. Fortunately, you can reverse a move with the *Undo* command.

The *Fill* command copies the contents (value and format, or formula) of the upper left cell in the range of cells into all the remaining cells in the selected range. This is handy for defining a row that consists of totals of a range of columns. You simply define the formula for one cell in the row

and then fill the remaining cells in the row with the same formula.

The *Transpose* command converts selected rows or columns into columns or rows.

The ***Format*** menu contains commands for specifying the format of selected cells in the spreadsheet as defined below.

The *Bold* and *Underline* commands change the style of a cell or range of cells. Activation is toggled between on and off.

The *Align left*, *Align center*, and *Align right* commands affect only text cells in a selected range. The values in the selected cells are aligned relative to their respective cell.

The *General*, *Fixed*, *Collars*, *Percentage*, and *Scientific notation* commands all specify the display format of numeric cells. The default format is *General* which rounds a number or converts it to Scientific Notation until it fits inside the cell. If the number is very large, the module displays two pound signs (##) in the cell.

The *Set decimal places* command specifies the number of digits that will be displayed to the right of the decimal point for a number with Fixed, Dollars, Percentage, or Scientific Notation format.

The *Commas* command controls whether or not commas are used to separate the digits to the left of the decimal place into groups of three. The default is no commas.

The *Red negative #'s*, and *Parenthesis neg. #'s* commands control how negative numbers are displayed in the selected cells. Both commands are active by default. Using a monochrome monitor, the negative number has a distinctive pattern if the red command is activated.

The *Set default format* command activates a dialog box which enables you to set all of the formats listed above for the entire spreadsheet. These defaults should be set when you first open the spreadsheet document. The format of individual cells can be modified later using the appropriate menu commands listed above.

The ***Options*** menu controls the way a document is displayed on the screen and how formulas are recalculated.

The *Manual calculation/Auto calculation* command controls the spreadsheet's ability to perform automatic calculations (default) or calculations upon request. The spreadsheet uses intelligent recalculation which means that the value of a formula cell is never recalculated unless the formula or one of the associated cells is changed. This saves computing time. When Auto Calculation is selected, each formula is immediately recalculated when an associated cell value is changed. When *Manual Calculation* is selected, each formula is recalculated only when requested by you using the *Recalculate* command.

The *Recalculate* command is activated by selecting the *Manual Calculation* command. When selected, this command causes the recalculation of all formula that have been changed or have had an associated cell changed. Check this command if you define, change, or paste a formula, then find the resulting value is not correct.

The *View formulas/View data* commands control whether the formula or the value of the formula (default) is displayed in a formula cell. The *View formulas* command is helpful when you want to check the logic of the spreadsheet you have created.

The *List functions*... command will produce a dialog box that lists all 82 built-in functions and operators that can be used in cell formulas. The dialog also provides the means to quickly add a particular function or operator to the formula that you are currently defining.

The *Change default width* command presents a dialog box that enables you to change the default width of the cell columns. This command only affects the columns that have not been resized using the mouse.

The *Restore width to default* command restores all columns to the default width.

The *Set titles*... command is a necessary feature that enables you to determine the identity of any cell you are viewing, even if your spreadsheet is at its maximum size. This command provides a dialog box that asks you

to specify top and/or left titles and the identity of the respective rows and/or columns. For instance, if the first column contains the categories in your budget and the first row contains the months of the year, you can specify top and left titles showing row 1 and column A. Then, no matter which section of the spreadsheet is displayed, you will always see the category and month that corresponds to the particular cell that you are viewing. You should disable the titles when printing a small spreadsheet because it causes the title row(s) and/or columns(s) to be printed twice.

The *Hide cell line* command controls whether or not the lines between cells are displayed and printed.

The ***Data*** menu provides additional data manipulation functions as well as the charting function.

The *Go to...* command moves the active (selected) cell to a cell that you specify in the dialog box. This is much faster than using the scroll bars.

The *Sort...* command provides access to the sorting capabilities of the module. When activated, this menu command produces a dialog box which requests information about sorting by ascending or descending order, sorting rows by columns or columns by rows, and the identity of the key cell. The key cell is used to identify which column or row in the selected range to sort. The sorting function is surprisingly quick and effective.

The *Protect* command causes a selected range of cells to be "locked" or protected from modification or deletion.

The *New chart* command produces a graphic representation of a selected row or column. The dialog box provided by this function enables you to choose from a pie chart (maximum of 24 slices), bar chart, 3D bar chart, line chart, or scatter chart. You can specify the first and last cells, maximum and minimum values, and the chart name. The newly created chart is treated as a graphics document in the graphics module where it can be edited and modified.

* *AppleWorks GS 1.1 can import AppleWorks 3.0 files, but there still may be limitations.*

The *Modify chart* command lets you update an existing chart to reflect changes in the spreadsheet document. You can recalculate the chart which simply changes the values, or you can change the chart which means starting over with the dialog box that was used to create the chart. This command also allows you to delete a chart.

Problems with the spreadsheet module

As with the other modules, if you try to get ahead of the module, it will get confused and go into the "Beep, Beep" mode. Again, this usually happens while cutting and pasting.

Although the module is easy to use and provides many features, it can be very slow, especially if you have many formulas, or formulas that affect many cells. Inserting or deleting rows or columns takes an amount of time proportional to the number of formulas that are affected and the number of cells associated with each of those formulas. Therefore, to save time you should set up your rows and columns just the way you want before you install the formulas. That way you can Insert, Delete, Cut and Paste, and Move cells around faster.

Like the database, the spreadsheet module cannot import spreadsheets from other applications as advertised in the manual. You can convert a properly delimited ASCII file into a new AppleWorks GS spreadsheet by opening it, but the *Import file...* command will not recognize any of those file types. Consequently, you cannot merge a spreadsheet you created with AppleWorks with one created with AppleWorks GS.*

Graphics

Menus

The *Save as...* command in the *File* menu, as in the other modules, provides an alternate storage format. In this case, a file can be saved in the Graphics module format or in the Apple Preferred Format (APF).

The ***Edit*** menu provides the standard *Undo*, *Cut*, *Copy*, *Paste*, and *Select all* commands. The remaining commands relate to handling graphic objects.

The *Duplicate* command will produce a copy of a selected object and place it next to the original.

The *Shadow* command will produce a drop-shadow for a selected object. The shadow is treated as a separate object.

The *Begin paint object* command groups each stroke into one object until you select a drawing or editing tool. If you wish to start a new object without selecting a different tool, select this command.

The *Collapse* command is used to collect any number of selected objects (paint or draw objects) into one object and remove hidden objects. A collapsed object requires less memory than the combined original objects. Once objects are collapsed, they cannot be separated.

The *Edit colors* command provides the same function as in the other modules. It edits color based on the RGB (red, green, blue) system or HIS (hue, intensity, saturation) system.

The ***Arrange*** menu provides commands for manipulating objects.

The first 4 menu commands, *Bring to front*, *Send to back*, *Shuffle up*, and *Shuffle down*, each move a selected object relative to other objects. The selected object can either be behind or in front of another object. *Bring to front* moves the selected object to the top layer. *Send to back*, moves the selected object to the bottom layer. *Shuffle up* moves the selected object one layer closer to the top layer. *Shuffle down* moves the selected object one layer closer to the bottom layer.

The *Group* and *Ungroup* commands are used to collect a number of objects into one object or to break such a group into their respective objects. The *Group* function is similar to the *Collapse* function but does not change the memory storage of the objects. Consequently, the objects can be separated again.

The *Flip horizontal* and *Flip vertical* commands flip a selected object about its vertical or horizontal axis.

The *Rotate left* and *Rotate right* commands move a selected object one pixel in the corresponding direction.

Under the ***Options*** menu, the *Choose font* command produces the same dialog box as in the other modules. However, in the graphics module you can change the font parameters for a particular text object only. You can have only one font style in a text object. Changing the font characteristics will change the entire text of the selected text object. Also, once a text object has been defined, the text cannot be edited in the graphics module. You must erase the text and start again.

The *Tools* command controls the status of the Tool palette. The Tool palette toggles between visible and invisible. The Tool palette is visible by default.

The *Pattern* command lets you access the Pattern palette. The Pattern palette provides draw and fill patterns for use with paint objects.

The *Grid* command controls an invisible grid similar to that in the database module. The horizontal and vertical lines are spaced 18 pixels apart and attract objects to the grid lines. You cannot modify the grid spacing.

The ***Tool Palette*** in the graphics module features three sets of tools: editing, drawing, and painting. The editing tools select, magnify, move, or erase parts of a graphic. The paint tools produce bitmapped graphic objects. The four paint tools consist of a pencil, a spray can, a paint bucket, and a paint brush of varying sizes and shapes. The drawing tools let you create mathematically defined shapes called *draw objects*. Draw objects include text, lines varying in width, arcs, and drawn shapes like ovals and rectangles.

The ***Pattern Palette*** provides the draw and fill colors and patterns for creating draw and paint objects. Sixteen solid colors, including black and white, are provided as well as *None*, which makes the line or fill transparent. The palette contains 120 different shade and pattern combinations for lines and fills. The color and/or pattern of a line is selected by holding

down the Option key while making the selection. Be careful when selecting colors and patterns. If the Select tool (the arrow pointer) is active and you select a color or pattern, all the colors of the current paint object will be changed to that color.

Problems with the graphic module

The sophistication level of this module forces the update of graphic objects to be extremely slow. The time required to complete a certain operation is proportional to the number of objects you have in the document. This lack of speed not only affects productivity, but if you aren't careful, it can lead to mistakes on the document because the module must process and store each brush stroke and drawn line. Consequently, if you work a few steps ahead of the IIGS and AppleWorks GS, the module will either completely miss the next stroke or paint a portion of it. Go slowly and save your document often.

This module is the second most unreliable after the word processor. That is, this module is almost as likely to lock-up or come up with a Fatal System Error as the word processors. To minimize the number or crashes, proceed slowly during drawing operations and minimize successive cut and paste operations.

The graphics module can import graphics files, but it usually imports only half of the picture. Which half it imports depends on the picture file type. This is a major bug which currently cannot be worked around.

Page Layout

This module brings Desktop Publishing (DTP) capability to the Apple IIGS. It provides sophisticated and easy-to-use features for arranging text and graphics into a document. The module imports both text and graphics. Text can be arranged into columns (up to 9). Graphics can be moved, cropped or scaled.

Imported text is placed into text objects which can flow from one column to another or to the next page. The text objects can be moved and resized

just by clicking and dragging. Page layout features include one or two Master Pages. Master Pages are used to specify text or graphics (headers, footers, page numbers, time and date stamp, etc.) that will be copied onto each page of the document.

This module is the most reliable of the six! No Fatal System Errors or "Beep-Beep" modes were encountered during the testing of the module. It is easy-to-learn, easy-to-use, and very versatile. The text manipulation is surprisingly quick and the commands perform as expected.

Menus

The ***File*** menu provides the standard functions as discussed in the word processing module.

In the **Edit** menu the *Undo*, *Copy*, *Cut*, *Paste*, and *Clear* commands are the same as in all other modules. However, the *Select all* command works a bit differently in the Page layout module. If you are using the text tool when you activate *Select all*, the entire text stream is selected. If you are using any other tool, just the current object (text or graphic) is selected.

The *Duplicate* command duplicates a selected object or objects and places the duplicate next to the original.

The *Insert pages* command produces a dialog box which lets you insert up to 99 pages, as long as the total number of pages in the documents does not exceed 99. The pages can be inserted at the beginning of a document, end of a document or after the current page. You should keep in mind that adding an odd number of pages will switch the left and right hand pages in a double-sided layout.

The *Delete pages* command enables you to delete a range of pages specified in the dialog box. This command cannot be reversed and it can affect the left and right hand page orientation.

The ***Options*** menu lets you view documents and formatting pages.

The *Fit in window/Actual size* command provides the capability of viewing a portion of a page (actual size) or the entire page. When viewing the entire page, you can draw on the page but cannot edit the text.

The *Hide tools/Show tools* command toggles the Tool palette on and off.

The *Hide guides/Show guides* command makes the dotted line guides on the page visible or invisible. These guides are used for aligning objects.

The *Set guides* command produces a dialog box that enables you to specify the number of columns, the column spacing, top, bottom, left, and right margin size. These settings determine the placement of the dotted line guides mentioned in the previous paragraph.

Lock guides/Unlock guides toggles the command, preventing the guides from being changed accidentally. The guides can be changed by the *Set guides* command even if they are locked.

The *Magnetic guides* command causes an object to move to the guide closest to it to ensure perfect alignment. This is called "snapping to guides".

The *Go to page...* command provides a fast way to quickly transfer to a specified page.

The *Set first page* command enables you to set the number of the first page from 0 to 9999. However, the page icons display only two digits so you will have to remember which page you are working with.

The *Ignore master page/User master page* command specifies whether or not the guides, text and/or graphics contained on the master page(s) are copied to the current page.

The *Left/Right master pages/Single master page* command controls the number of master pages (one or two). If one master page is originally selected but is then changed to two, the single master page becomes the right page. For the opposite case, the right master page becomes the single and the left master page is lost.

The ***Arrange*** menu provides commands for manipulating the objects in the page layout document.

The *Bring to front* command moves a selected object to the front of one or more overlapping objects.

The *Send to back* command moves a selected object behind one or more overlapping objects.

The *Flip horizontal* and *Flip vertical* commands flip a selected object about its vertical and horizontal axis, respectively.

The *Rotate left* and *Rotate right* commands rotate a selected object 90 degrees in the indicated direction.

The ***Text*** menu provides commands for changing the alignment and line spacing of text. The commands apply only to the paragraph containing the insertion point.

The first four commands control text justification: *Left*, *Center*, *Right*, and *Full*.

The next four menu commands control the line spacing. Single space, 1½ space, and Double space are provided as well as a *Set spacing...* command which enables you to specify the line spacing in points from 4 to 64.

The Font, Size, Style, and Color of the page layout module provide the same commands and operate in the same way as the corresponding menus in the word processor module.

The Page Layout module is equipped with 11 tools in the ***Tool Palette*** for manipulation of text and graphics.

The *Selection Arrow* is used to select and move objects.

The *Text Tool* is used to add text to a page layout document. With this tool you can create text objects and move the text insertion point. Text objects can be linked so that the text stream flows from column to column and page to page.

The *Page Number Tool* enables you to specify where the number of the current page is placed. This tool is usually used when defining the master

page(s) so that the page numbers are placed at the same location on every page.

The *Date Tool* is used to place the current date at a specified location on the current page. If used on the master page(s), the current date is placed on every page, usually in the header.

The *Horizontal / Vertical Line Tool* draws horizontal or vertical lines of various selectable widths. The line width is selected from the Line Width palette.

The *Line Tool* draws lines of various selectable widths at any angle.

The *Rectangle Tool* draws filled or hollow rectangles outlined by selectable line widths. The *Filled/Hollow* icons are used to control whether a rectangle is filled or hollow. If the Shift key is depressed during the drawing, a square is drawn.

The *Rounded Rectangle Tool* draws rectangles with rounded corners. The rectangles can be filled or hollow with selected border widths. Depress the Shift key to draw squares with rounded corners.

The *Oval Tool* draws filled or hollow ovals with selectable border widths. Depress the Shift key to draw a perfect circle.

Page Icons

Horizontal and Vertical rulers are provided for the accurate placement of guides and objects. The rulers also include tabs and indentation markers.

Guides

As mentioned previously, the placement of the Guides is determined by the *Set guides* command. However, you can create additional Guides by dragging from the ruler scales into the page area. To create a horizontal guide, drag from the horizontal ruler at the top of the page area into the page area. These new guides can be locked and magnetized.

Problems with the Page layout module

As mentioned earlier, this module is the most reliable of the six. However, it is not free of problems.

When importing graphics to the page layout document, making the original graphic object the same size as the object in the document will maximize the clarity of the picture on the screen.

Communications

The communications module opens the world of telecommunication to any AppleWorks GS user who owns a modem. You can access the latest world and financial news, and access local bulletin boards and national online services like CompuServe and America Online.

This module provides an easy-to-use desktop communications environment that accommodates almost any modem: internal or external, 110 to 19200 baud, with any parity, handshake and data options. The module supports XModem, XModem CRC, YModem, and Binary II communication protocols and file formats.

Menus

The ***File*** menu provides the standard commands with the exception of commands related to printing, since the communications module does not support printing. The module can import any AppleWorks GS word processing file or ASCII text file.

The *Copy*, *Paste*, and *Select all* commands in the ***Edit*** menu provide the standard functions in this module. *Undo*, *Copy*, and *Clear* are not supported, however.

The ***Transfer*** menu provides the commands for sending and receiving text and files.

The *Receive file...*, *Receive batch...*, and *Receive binary II...* commands each provide a dialog box for specifying the protocol (XModem, XModem CRC or YModem), the disk, and the folder location for file storage. The *Receive file...* command's dialog box also requests a file name. You can name a received file but batch and Binary II data files are automatically named by the sender.

The *Send file...*, *Send batch...*, and *Send Binary II...* commands perform the reverse functions of the three above. These commands produce the same type of dialog box, however. The *Send Batch* and *Send Binary II* dialog boxes display lists of files to be sent. You can add or remove files from these lists using the buttons in the dialog box.

The *Capture text/End text capture* command enables you to save all of the text that you receive from the other computer until you activate the *End text capture* command. Once *End text capture* is invoked, a dialog box appears and asks you to specify the file name to save the text under. The amount of stored text is only limited by you or by the amount of system memory.

The *Send text* command enables you to send a specified text file to a remote computer. The difference between *Send text* and *Send file* is the transfer process. The *Send text* command uses a protocol that does not provide any error checking.

The *Cancel* command halts any transfer operation. The transfer operation that was in process when the cancel command was executed is listed next to the *Cancel* command in the menu. This helps to inform you of what is being cancelled.

The ***Settings*** menu controls the communication and hardware settings as well as the commands that are displayed on the screen.

The *Show control* command controls whether or not Control Characters (^M, ^J, etc.) are displayed in the communications window. The default setting shows the Control Characters.

Activating the *Edit line* command lets you edit a line of text before sending it. Selected text can be deleted but cannot be copied to the clipboard.

The *Status bar* displays the status of the communications session at the top of the communications window. The *Status bar* can be toggled on or off to make it visible or invisible. The bar is visible by default.

Activating the *Local* command temporarily disconnects your computer from the remote computer. This allows you to complete file operations and then return to communications.

When activated, the *Hardware* command produces a dialog box that displays the characteristics of your modem. The dialog allows you to specify several types of devices as well as port connection. If your modem requires an initialization string, you can enter this in the appropriate box.

The dialog box that is produced when the *Communications* command is activated enables you to specify the communication parameters that your modem and the remote computer's modem require. You must specify the proper Baud rate, Parity, data format, and handshake controls. The AppleWorks GS manual and the information provided with your IIGS and your modem will specify these parameters. With this dialog, you can also specify tone or pulse dialing, echo, and dial time. The dial time is the period, measured in seconds, that the module allows for making a connection before deciding that the phone line is busy. The default time is 30 seconds.

The ***Phone*** menu provides the commands for dialing, answering, and hanging up the phone.

The *Autodial* command tells AppleWorks GS to automatically redial the telephone number if the line was busy.

The *Dial* command lets you create and maintain a telephone directory with the names and numbers of frequently used remote systems. A dialog box is provided for adding and removing these names and numbers. Of course, you can also dial a selected number from this dialog box. The numbers are stored with a *Fast Dial* key which allows you to dial a particular phone number in the list simply by typing that Fast Dial key while holding down the Option key.

The *Hangup* command is used to disconnect your modem from the remote system.

The *Answer phone* command enables you to set up your IIGS as a remote system for other computers to call. When you select this function, AppleWorks GS will sit and wait for the phone to ring. When it does, AppleWorks GS will answer on the first ring and establish communications with the calling system.

Problems with the communications module

As mentioned at the beginning of this report, the communications module requires the Monaco 9 font for proper operation. If this font is not in the startup disk Font folder, the module will default to another font which is much larger and makes the communications environment unreadable.

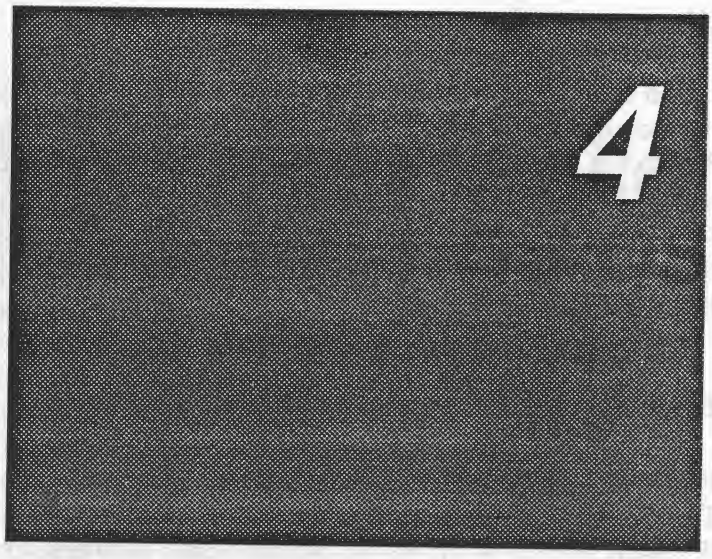
Summary

AppleWorks GS is a massive program that performs an unprecedented number of functions on an Apple IIGS. Accomplishing all of these functions requires all of the IIGS hardware capability. This intensive hardware requirement has a direct effect on the execution of features in AppleWorks GS. This fact is probably most evident when you print any of the AppleWorks GS documents to an ImageWriter printer. One single page can take about 5 minutes! The AppleWorks GS program has maximized the use of the IIGS architecture. Its only drawback is the bugs present in the software.

AppleWorks GS is a version one release and can be expected to contain some bugs. In fact, there are several serious bugs in the program: notably, the frequent Fatal System Errors. However, this bug may be caused by the interaction between AppleWorks GS and the new Apple IIGS operating system, GS/OS. GS/OS uses a disk caching function that is rumored to set up conditions where AppleWorks GS may accidentally corrupt data in memory and on disk.*

* *Many of the problems and bugs discussed in this special report have been corrected with AppleWorks GS version 1.1. Claris Technical Support can be reached at 408-727-9054.*

GS/OS



Chapter 1
System Software 4.0

The Apple IIGS has been astounding Apple enthusiasts for over two years with its advanced graphics and sound capabilities. But it wasn't until the IIGS was two years old that Apple gave the IIGS its real heart: GS/OS, the "Apple IIGS Operating System".

A thermometer

As soon as you turn on your IIGS with GS/OS on your boot disk, you will see a rectangle enclosing a picture of a IIGS and a welcome message. You will also see a horizontal thermometer. This little gadget fills with red from left to right indicating the status of the time left in the boot process. When booting is complete, the screen will change to the familiar Desktop. Besides a few changes to the menu bar, everything looks the same as in ProDOS 16.

Speed

The primary advantage to this new operating system is its speed! Depending on the number of desk accessories in the System disk Desk Accessories folder, GS/OS can boot to the Finder in a blinding 35 seconds! ProDOS 16 dragged along at about twice that speed under the same conditions. There are several reasons for this increase in processing speed – coding, disk caching, and a new data storage method.

ProDOS vs. GS/OS

ProDOS 16 is an operating system that is a variation or advancement of ProDOS 8. That is, ProDOS 16 is a 16 bit program built around the ProDOS 8 8-bit operating system. Because ProDOS 8 and the ProDOS file structure were stable, it was faster and easier for Apple to develop ProDOS 16 rather than an entirely new operating system. Apple was then able to release the IIGS when the hardware was ready without having to wait for the development of GS/OS. The IIGS comes equipped with a 16-bit architecture (including the 65816 CPU chip) so this 8-bit ProDOS operating system does not take full advantage of the extensive structure of the IIGS. GS/OS takes full advantage of the IIGS architecture because it is a 16-bit program. It is an expandable system containing separate RAM based device drivers and File System Translators (FSTs). Like ProDOS 16, GS/OS is downward compatible, which means it works with both ProDOS 16 and ProDOS 8 files, applications, system calls, and tools.

Disk cache

The second reason why GS/OS is faster than ProDOS 16 is a process known as Disk caching Basically, GS/OS sets aside a portion of RAM memory (the cache) for the storing of frequently accessed disk blocks for faster retrieval. This process derives its speed from the operating system's ability to read the blocks from the disk only once and write the blocks to RAM memory. When those blocks are required again, the operating system reads them from RAM. This process is fast, because the system does not have to wait for a disk drive to spin around. The default size of this cache is 32K but is adjustable by 32K increments using a New Desk Accessory called "Disk Cache" included with GS/OS. The bigger the cache, the greater the advantage unless your application does not require much disk activity. In that case, you won't see any improvement in performance. The size of your disk cache should not get in the way of memory needed for applications, since GS/OS is supposed to automatically trim the cache if necessary.

Disk blocks

Another reason for the speed of GS/OS is the way it reads and writes information to a disk. ProDOS and GS/OS operating systems do not write data onto a disk sequentially, character by character. Instead, these operating systems collect output data into a block in RAM. A block can contain up to 512 K, equal to about 512 typewritten characters. The operating system will write this block on to the disk in a location called a sector and then go back to build another block. A sector can contain two blocks of data. A sector is a part of a track and a track is one of many concentric magnetic circles on a disk (similar to the track on an 8-track tape cassette). Blocks are usually not written onto the disk in sequential sectors due to process time requirements of the operating system for a particular block. The disk is spinning during this processing time . Consequently, the next sector on the disk spins past the read/write head by the time the operating system is ready to read/write the next block. If the operating system tried to read/write the blocks to sequential sectors, it would have to wait until the disk rotated fully before the next sector could be accessed. This would cause a significant delay in the overall operating system processing.

Sector interleave

Designers solved this problem with a process called "Sector Interleave" or skewing. In this process, two blocks are stored on each sector and the sectors are interleaved. For example, suppose that blocks were stored in sequential sectors as described in the previous paragraph. Imagine that the numbers 1 through 10 represent a software sector or two blocks of data. The software sectors 1 through 10 are stored sequentially on the physical sectors. Sector Interleaving removes this alignment. Here, the software sectors are stored on every fourth physical sector. That is, there are three physical sectors in between software sectors 1 and 2, 2 and 3, 5 and 6, etc. This is the type of interleaving used by ProDOS 16. After writing (or reading) a software sector to a physical sector, the operating system builds another software sector. When the system is ready to write the next software sector, the disk rotates such that the next available physical sector is the fourth sector behind the sector that was just written to. This type of interleaving is said to be 4:1 (4 to 1) because 4 sectors pass the read/write head for every one that is written to (or read).

With GS/OS the software blocks are stored sequentially on every other physical sector, making GS/OS about twice as fast as ProDOS 16 in reading and writing to disk files. This translates to an overall increase in operating system speed.

Now that you understand the concept of interleaving, you have probably asked yourself the questions, "Can GS/OS read my ProDOS formatted disks?", and "Should I reformat and recopy all my disks with GS/OS?". As stated earlier, GS/OS is downward compatible with ProDOS 16. It certainly can read ProDOS formatted disks, but not as fast as it can read GS/OS formatted disks. As for reformatting and recopying disks with GS/OS, it depends on whether or not you plan on using ProDOS 16 again after you get GS/OS. Although the two operating systems are basically compatible, refer to Figure 3 and you will see that it will take ProDOS 16 longer to read a GS/OS formatted disk than to read one of its own disks simply because it is not fast enough to read that next sector before it spins past the read/write head, requiring an additional revolution of the disk to read the next sector. Therefore, any application running under ProDOS 16 that requires disk access will run slower if it must access a GS/OS disk. Keep that in mind before you start reformatting disks!

New structure

Speed is not the only reason why GS/OS is so special. GS/OS has a completely new structure that solves some of the major ProDOS 16 problems. The file access limitations of ProDOS 16 (8 open files, 14 active volumes, etc) have been removed allowing GS/OS an unlimited number of open files, active volumes, and devices.

System expansion

The operating system can be expanded just as easily as the IIGS hardware can. That is, for every new peripheral or card that is produced for the IIGS, a corresponding piece of software can be added to GS/OS. This is accomplished through the use of RAM based device drivers. The GS/OS System disk comes with a folder that contains files which are loaded into

memory by the operating system at startup. These files (sometimes referred to as updates in the Apple documentation) are the communication link between the operating system and peripheral devices such as 3.5 inch and 5.25 inch floppy disks, Small Computer Serial Interface (SCSI) devices, LaserWriters, and ImageWriters. Providing device drivers separately from the main operating system gives you the ability to remove unnecessary drivers, thereby decreasing boot time, and to add or modify drivers when necessary without requiring a major System update. GS/OS also has the ability to generate its own device driver on the fly for some devices. For instance, the system disk does not provide a RAM-disk driver so if you have enabled a RAM-disk, GS/OS will generate its own RAM-based driver!

FSTs

One of the most exciting features of GS/OS is the implementation of File System Translators (FSTs). A FST is a file which GS/OS uses to read a file system other than ProDOS. Files generated by DOS 3.3, Apple Pascal, the Macintosh, and MS-DOS are non-ProDOS file systems. The new system disk also contains FSTs for communicating with ProDOS files, character devices (like the keyboard and display), and the new High Sierra file system that is the accepted standard for use on CD-ROMs. But the FSTs for the other systems have not been developed yet.

The finest feature of the FST system is that new translators can be developed either by Apple or third party developers. Generation of an FST that enables GS/OS to read MS-DOS formatted disks will be of top priority. However, don't expect this soon, because translation is only part of the problem with treading MS-DOS disks. MS-DOS disks use a different storage format that is not currently readable by the available Apple II disk drives.

Two other eagerly awaited FSTs are the Macintosh HFS (Hierarchical File System) and AppleShare translators. The HFS FST enables GS/OS to read and write Macintosh files. However, they don't allow the IIGS able to run Macintosh software applications. The AppleShare FST enables the IIGS to participate in a full AppleTalk network with a Macintosh as file server. Presently, GS/OS contains the software necessary for your IIGS to access printers on an AppleTalk network but not to transfer files.

Utilities

When you boot GS/OS, it scans the IIGS system and looks for all disk devices. When it finds one, it looks for a device driver or FST in the /SYSTEM/DRIVERS/ subdirectory. If it finds one, it loads it. If not, it generates one automatically for all devices except SCSI drives and 5.25 inch floppy disk drives. You must install these drivers yourself using one of the three utilities provided with GS/OS.

The Installer

GS/OS consists of many different files located in separate subdirectories on two disks. Apple has provided a utility called the Installer that automatically updates your boot-disk files with the new files. The Installer is interactive, so you have the choice to install or de-install one device driver, all the device drivers and FSTs, or the entire System Software Update! When you start the Installer you will see a list of scripts in the left window. A script is a collection of instructions that the Installer follows to accomplish the transfer of a particular file. All you have to do is indicate the target disk and select the appropriate script. The Installer does the rest. Included with the installer is a help facility that will let you know what each script is for.

The Advanced Disk Utility

The second utility provided with GS/OS is the Advanced Disk Utility. This utility is used for preparing disks to receive data. It enables you to *initialize*, *erase*, *zero*, and *partition* disks.

Initializing

Initializing the disk divides it into tracks and sectors, and writes a file system on the disk so it can be read by a particular operating system. Initialization enables you to name and format hard disks, volumes, 3.5 inch and 5.25 inch floppy disks and RAM-disks. In the case of 3.5 inch floppy disks, you have a choice of 3 formats. The 800K 2:1 interleave is

the standard GS/OS format. The 400K 2:1 interleave is a GS/OS format for single-side 3.5 inch disks. The 800K 4:1 interleave is the standard ProDOS 16 format. For faster access, choose this format if the disk is to be used with both Apple and UniDisk 3.5 inch floppy disk drives, regardless of the operating system that is to be used.

Erasing

Erasing a disk simply removes the volume directory (the list of files on the disk). The disk is not actually erased, nor is the file format removed, so this process is faster than initializing. For all practical purposes, the files are gone and you can use the disk immediately for storing new files using the same file format. The new files are just written over the old files. However, the files are still accessable to someone who knows how to cause the computer to read a disk without using the directory.

Zeroing

If you have stored confidential data on a disk and you want to make sure that no one can recover that data, then you should zero the disk. In this process, the computer removes all the data and the file system by completely writing over the entire disk. This process effectively removes any data, but takes longer than the initialization or erasing process, because the computer has to overwrite every sector. After a disk is zeroed, it must be initialized again before it can store data.

Partitioning

Partitioning is the last feature of the Advanced Disk Utility. It provides you with two new and powerful features. The first partitioning feature enables storage of different documents and applications from two different operating systems on the same disk. The second feature removes the limit on volumes for a hard disk. So for those of you with an 80 MB disk with a card initializing program that allows only two partitions per card, you can now use your entire 80 MB rather than only 64 MB.

Take note!

If you have decided not to buy the System Software manuals, the Advanced Disk Utility is a good reason to change your mind. The execution of the ADU is not very intuitive and requires some tutorial time. Also, there are a few hazards associated with initializing, erasing/zeroing, and partitioning disks. The System Tools manual contains the information necessary to use the ADU effectively and safely. This manual also provides similar information on the Installer plus important information necessary for using the AppleTalk Printing Utilities available with GS/OS. The users guide also provides useful information.

The Finder

The third utility included with GS/OS is the Finder. The Finder is still the handy file managing Desktop, but with a few new features. First, the menus have three new commands: *Verify Volume*, *Validate* (a file), and *Shutdown*. *Verify Volume* counts any and all of the bad blocks on the disk. This process takes about 39 seconds for an 800K disk. If there are bad blocks on a disk, the Finder will tell you how many and, if you wish, will show you which ones are bad. If you have a disk with bad blocks, you should copy all the files you can from that disk to another disk, then reformat the old disk. Verify the old disk again and discard it if bad blocks still exist, since that means that the magnetic material has been damaged.

The *Validate* command checks the integrity of a file or group of files. If you open a file and get hieroglyphics, the file may be corrupted.

The *Shutdown* command gives you an efficient way to shut down your system. This command also shuts down the device drivers and FSTs, and clears the RAM cache of any remaining data. When you select *Shutdown*, GS/OS gives you three choices: 1) Turn off system power, 2) Restart, or 3) Return to launching application. If you select the first choice, the system acts as if you had turned off the power switch, at least in terms of retained memory. This is called a frigid boot. Whatever you had in memory, specifically the RAMdisk, is lost during the boot. The last dialog box

you see after making this choice gives you a chance to restart the computer. Choice number 2 simply does the same thing as pushing ⌘-Control-Reset. The system reboots without losing the contents of the RAMdisk. This is referred to as a cold boot. The last choice simply returns you to the Finder.

The Finder also provides all of the initialization options that the ADU provides and takes advantage of new software for copying files to other folders or volumes. This new code implements what is called "Session Copy", which waits until after copying the data files before it writes the pertinent data into the new files directory. This minimizes movement of the disk drives read/write head. Couple this process with the new interleave format, and you achieve decreased copy time. The copy functions also keep you better informed of the copy process with the same dialog box used by the Macintosh when it copies files. This box displays the number and names of files remaining to be counted and a thermometer which indicates how much of the copy process has been completed.

GS/OS tech talk

If you are a programmer, then you will be happy to know that GS/OS supports all ProDOS calls. All GS/OS calls go through the System Call Manager (SCM), which directs them to the proper FST. The SCM and FST then use the Device Manager to direct input/output to the proper device driver. This allows an application to use the same set of GS/OS calls to process data from different device types.

In GS/OS, the calls are separated into two classes – Class 0, which are all the ProDOS 16 calls, and Class 1, which are all the GS/OS calls. Most Class 0 calls have a corresponding Class 1 call, but there are Class 1 calls that do not have Class 0 equivalents. The Class identifier is located in the high order three bits of the call number. The GS/OS calls require a parameter count which means that the call data structures need to be only as long as necessary. Many of the GS/OS calls use the same data structures that are used by ProDOS 16. ProDOS has two types of files – Directory and General Data. GS/OS provides a third file type, Extended, which is the same type of file the Mac HFS operating system uses. This file structure is split into two components – resource and data. The data component

contains program code, etc., and the resource component contains data structures, menu data, etc. This configuration is primarily used by programmers to improve the organizational structure of programs. The introduction of the resource and data component format will eventually lead to new resource structures in programs that can be edited by a program user. New resource editors will enable you to customize the look of your copy of a program.

GS/OS also uses two types of strings – Class 0 and Class 1. Class 0 strings contain a length byte, while Class 1 strings contain a length word (two bytes). Class 1 strings that are output from a GS/OS call make provision for the length of the output buffer by adjusting the buffer if it is too small.

GS/OS contains a number of changes to the types and uses of strings, prefixes (31 now vs. 16), pathnames, and filenames. These are now extended to allow use of any legitimate Mac HFS pathname. Some prefixes (Type 2) may use a colon (:) or slash (/) as a separator between the volume name, directory names, and the filename. With GS/OS you can specify device names. Each device name begins with a period (.) followed by a unique device identifier. A pathname can also be tacked onto the end of the device name. Examples of character device names are .CONSOLE and .PRINTER.

Wrap up

GS/OS is indeed a new and more powerful "heart" for the IIGS, but it does not fix all the problems of ProDOS 16, nor does it meet all expectations. One of the major shortcomings of System Software 4.0 is its lack of AppleShare compatibility. The new System update does include AppleTalk software that allows your IIGS to communicate with printers shared in an AppleTalk network. Fortunately, that communication extends to a Macintosh or an AppleShare file server, the heart of an AppleTalk network, in System Software 5.0. GS/OS does provide an increase in system speed. However, disk access and screen redrawing can still be slow for the larger and more complex programs being developed for the IIGS. If these programs and existing programs take advantage of the new GS/OS resources (especially disk caching) then maximum speed can be attained.

Is ProDOS 16 obsolete? No, you should keep ProDOS 16 to use with older Apple IIGS software that is not compatible with System Software version 5.0. Apple will no longer update ProDOS 16, however.

Because of the difference in file structure between MS-DOS and Apple disks, a MS-DOS FST is like a bicycle without wheels. When the new 1.44 Megabyte FDHD external drive that came out with the new Macintosh IIx becomes available to IIGS users, then the MS-DOS FST will be a real prize!

Although the High Sierra CD-ROM driver will allow playback of video, audio, and text on the IIGS from a CD, most of the computer CDs available are in the MS-DOS format. Until the MS-DOS FST is available, a IIGS user will have to settle for the limited library of CDs available.

Finally, reports of possible bugs in GS/OS are beginning to appear. Common problems appear to be related to the GS/OS disk caching operation. It is suspected that some programs (possibly even the Finder) may be accidentally overwriting the RAM allocated for the cached data thereby causing lost data and lost files. Remember to save your documents often, and print out a hard copy after each revision.

Chapter 2
System Software 5.0

In June 1989 Apple released System Software version 5.0 to an expectant public. This version of the System Software includes many improvements to the Toolbox, GS/OS, utilities, as well as new tools and features.

Speed

- Drawing – 200% to 300% faster
- Window manipulation – 300% to 800% faster
- Switching between P8 and GS/OS – 700% to 1500% faster
- Small Computer Systems Interface throughput – 400% faster

AppleShare

The biggest new feature in System Software version 5.0 is that the software is now AppleShare Aware. A new AppleShare FST has been created to work with GS/OS and make the IIGS a true network machine. The Finder utility and GS/OS have been modified and improved to work well in a network environment.

Resources

System Software version 5.0 includes the capability to create and use resources like those used by the Macintosh. This is an advantage to programmers and users alike, since it allows smaller and more efficient programs. Eventually, Resource Editors will be developed to allow end users to customize their programs.

ExpressLoad

ExpressLoad is a new part of the System Loader. It speeds up the booting and launching of applications by remembering where each segment of a program is on disk, rather than having to search for each segment. In order to take advantage of ExpressLoad, a program must be modified to the ExpressLoad format. The latest versions of GS/OS and AppleWorks GS, for example, are in ExpressLoad format. This is one reason why they load more quickly than before.

Toolbox

Three new toolsets have been added to the Toolbox – the Resource Manager, the SCSI Manager, and the Text Edit toolset. The SCSI Manager works only with the Apple SCSI card. The Text Edit toolset is designed specifically to make the design of text editing functions and programs easier. Like most tools, only programmers will use these new toolsets directly . However, when commercial Resource Editors are available, end users will be able to use the Resource Manager to customize their applications that use resources.

The Advanced Disk Utility

The GS/OS team has fixed a number of bugs in the Advanced Disk Utility. It now allows you to partition your hard disk into at least 8 partitions. However, this is true only if you are using an Apple SCSI card and if your startup files are not on that hard disk.

The Installer

The Installer now lets you select more than one script at a time. The *Install Everything Possible* script has been replaced by two new scripts – *Latest System Files* and *Latest System Files (No Finder)*. These two scripts do the same thing as the *Install Everything Possible* script, but also give you the option of not installing the Finder. The Installer also provides more helpful hints and warnings before and during the execution of some scripts.

The differences between version 5.0 and 5.02 are primarily related to problems in 5.0 that are fixed in 5.02. There are many more changes and improvements than these few mentioned here. You will notice the effect of them as new programs that take advantage of them are published. Even now you will see new features, like scrolling menus and pop-up menus in the Finder, ADU, and Installer.